

Eyesys Mini-IMG Gauge Controller

INSTRUCTION MANUAL

Manual No. 699908055
Revision C
March 2006



Eyesys Mini-IMG Gauge Controller



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 Customer's expense; in addition, a charge for testing and examination may be made on Products so returned.

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Declaration of Conformity
Konformitätserklärung
Déclaration de Conformité
Declaración de Conformidad
Verklaring de Overeenstemming
Dichiarazione di Conformità



We
Wir
Nous
Nosotros
Wij
Noi

Varian, Inc.
121 Hartwell Avenue
Lexington, MA, 02421-3133 USA

declare under our sole responsibility that the product,
erklären, in alleiniger Verantwortung, daß dieses Produkt,
déclarons sous notre seule responsabilité que le produit,
declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilità, che il prodotto,

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to which this declaration relates is in conformity with the following standard(s) or other normative documents.
auf das sich diese Erklärung bezieht, mit der/den flogenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (auz) norme(s) ou au(x) document(s) normatif(s).
al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).
waamaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.
a cui se riferisce questa dichiarazione è conforme alla/e sequente/I norma/o documento/I normativo/i.

- EN 35011**
1991 Group 1 Class A ISM emission requirements
- EN 61010-1**
1993 Safety requirements for electrical equipment, control and laboratory use
incorporating Amendments Nos. 1 and 2
- EN 50082-2**
1995 EMC heavy industrial generic immunity standard

A handwritten signature in black ink that reads "Frederick C. Campbell".

Frederick C. Campbell
Operations Manager
Varian, Inc.
Lexington, Massachusetts, USA

October 2003



Preface

This manual explains the operation, configuration of the Eyesys Mini-IMG Gauge Controller. It also explains, in appendixes, the specifications and the related gas correction factors.

Document Conventions

The following format is used in this manual to call attention to hazards.

WARNING



Warnings are used when failure to observe instructions or precautions could result in injury or death.

CAUTION



Cautions are used when failure to observe instructions could result in damage to equipment, whether Varian supplied or other associated equipment.

NOTE



Notes contain information to aid the operator in obtaining the best performance from the equipment.

Eyesys Hazards

This product must only be operated and maintained by trained personnel.

Before operating or servicing equipment, read and thoroughly understand all operation/maintenance manuals provided by Varian. Be aware of the hazards associated with this equipment, know how to recognize potentially hazardous conditions, and how to avoid them. Read carefully and strictly observe all cautions and warnings. The consequences of unskilled, improper, or careless operation of the equipment can be serious.

In addition, consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Varian office.

EMC Warnings

EN 55022 Class A Warning

This Class A product, in a domestic environment, can cause radio interference in which case the user may be required to take adequate measures.

FCC

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.



This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, can cause harmful interference to radio communications. Operation of this equipment in a residential area is also likely to cause harmful radio communications interference, in which case, the user is required to correct the interference at their own expense.

Installation Requirements

To maintain compliance with both the FCC Part 15 rules and the European Union's EMI directives, use a shielded cable constructed of a braided shield and metal or metalized plastic backshells directly connected to the cable shield at the 15 position D-Sub connector of the Eyesys Mini-IMG. Connect the shield to ground at the user's equipment. Failure to install the equipment in this way can result in the unit no longer meeting the requirements for radiated emissions and susceptibility.

Contacting Varian

In the United States, you can contact Varian 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 Eyesys Mini-IMG is a vacuum measurement instrument based on the inverted magnetron gauge design. The transducer tube is all metal with internal grounding, requiring no special grounding from the Mini-IMG to the vacuum chamber.

Installation

Installation consists of:

- ❑ “Electrical”
- ❑ “Mounting” on page 1-2

Electrical

Table 1-1 lists pinouts for use in connecting the 9-pin D-subminiature connector. Shielded cable is required for CE and FCC compliance. See “EMC Warnings”.

Table 1-1 9-Pin D-subminiature Connectors

1	+24 V Power Input
2	Power Ground
3	Analog Pressure Signal Output
4	Analog Ground
5	No Connection
6	No Connection
7	No Connection
8	No Connection
9	Remote On/Off (Reference Pin 4)

To perform electrical connections:

- ❑ Connect +24 VDC Power and Power Ground connections as required.

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Mounting

Viton O-rings are recommended for NW-25 KF and NW-40 KF fittings. For highly reactive or corrosive applications, consult with your O-ring supplier.

Figure 1-1 gives the controller dimensions for reference.

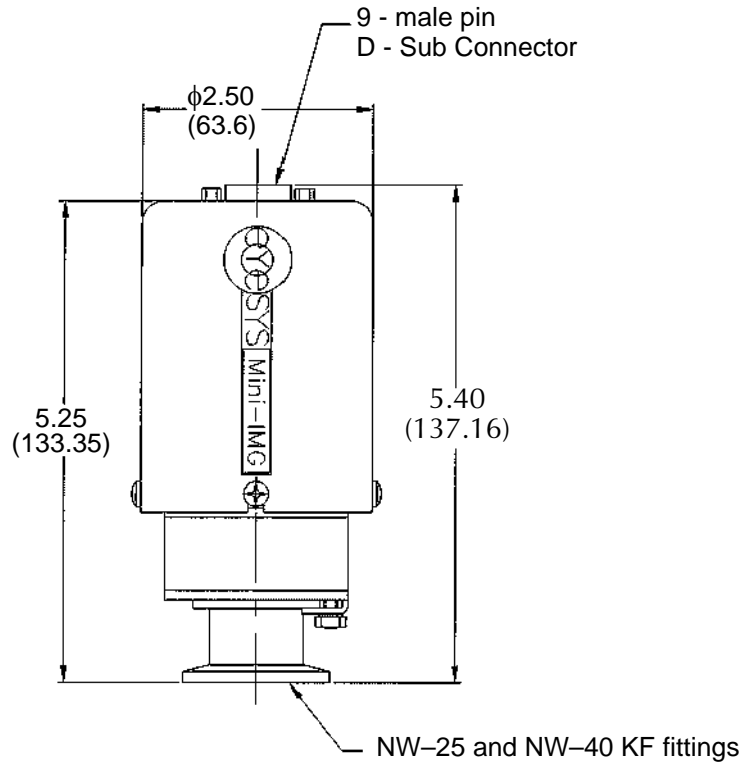


Figure 1-1 Eyesys Mini-IMG Gauge Controller Dimensions

Eyesys Mini-IMG Gauge Controller

To mount the gauge:

1. Remove plastic protective cap.
2. Mount the Eyesys Mini-IMG on the desired vacuum system fitting, obeying these guidelines:
 - ❑ Minimize conductance losses between the Eyesys gauge and the vacuum system
 - ❑ Mount the Eyesys Mini-IMG preferably with the vacuum fitting pointing down to minimize particulate contamination.
 - ❑ Mount the Eyesys Mini-IMG away from sources of contamination.

The Eyesys Mini-IMG system test port comes in two types:

- ❑ KF – uses a quick clamp connector (Figure 1-2):
 - a. Place the test sample connection onto the KF connector.
 - b. Place the quick clamp onto the test port and tighten the wing nut clockwise until it is just tight enough to stay in place.

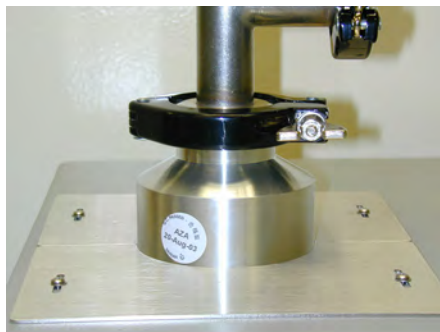


Figure 1-2 KF Input Connection

Controls

This section discusses the following controls:

- “Remote Gauge On/Off Pin”, which enables automatic gauge on/off
- “Voltage Output”, which enables monitoring of the analog pressure signal

Remote Gauge On/Off Pin

The Eyesys Mini-IMG and the gauge tube can be turned on by applying +24 VDC power or by manipulating the Remove Gauge On/Off pin as explained in Table 1-2.

Table 1-2 9-Pin Voltage Conditions

Voltage Level on Pin 9 (Referenced to Pin 4)	Result
Single flashing LED at top of scale	Emission OFF
Less than .5 VDC	Gauge tube turns on (High Voltage ON)
Greater than or equal to 2.5 VDC	Gauge tube turns off (High Voltage OFF)
Pin not connected	Gauge tube turns on (HV ON) when +24 VDC power applied to Pin 1. Gauge turns off when +24 VDC removed from Pin 1.

Voltage Output

The analog pressure signal is available on the 9-pin D-subminiature connector using the Analog Pressure Signal Line (pin 3) and the Analog Ground line (pin 4). The signal is a 1 V/decade output representing the log of the pressure, offset to a range between 1 and 9 VDC.



Do not turn on the gauge tube high voltage above 50 mTorr. Higher pressures give a false voltage (lower voltage) output since the electronics limits the power going out to the inverted magnetron gauge, resulting in a lower to almost undetectable ion current signal. This minimal ion current flow is then misinterpreted as a low vacuum signal. Use a transition gauge such as a Thermocouple or a ConvecTorr gauge to activate or indicate that the remote I/O can be enabled.

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To calculate pressure, given volts: Pressure = 10 (Volts -10) for Torr
 10 (Volts -10) x 1.33 for mbar
 10 (Volts -10) x 1.33 for Pascal

Refer to Table 1-3 to calculate pressure using the above formula. Figure 1-3 shows Output Voltage vs. Output Voltage as a Function of Pressure.

Table 1-3 Pressure Calculated by Voltage Level

Voltage greater than	But less than	Indicate pressures in this range:
1	2	1×10^{-9} Torr, 1.33×10^{-7} Pa, 1.33×10^{-9} mbar
2	3	1×10^{-8} Torr, 1.33×10^{-6} Pa, 1.33×10^{-8} mbar
3	4	1×10^{-7} Torr, 1.33×10^{-5} Pa, 1.33×10^{-7} mbar
4	5	1×10^{-6} Torr, 1.33×10^{-4} Pa, 1.33×10^{-6} mbar
5	6	1×10^{-5} Torr, 1.33×10^{-3} Pa, 1.33×10^{-5} mbar
6	7	1×10^{-4} Torr, 1.33×10^{-2} Pa, 1.33×10^{-4} mbar
7	8	1×10^{-3} Torr, 1.33×10^{-1} Pa, 1.33×10^{-3} mbar
8	9	1×10^{-2} Torr, 1.33×100 Pa, 1.33×10^{-2} mbar

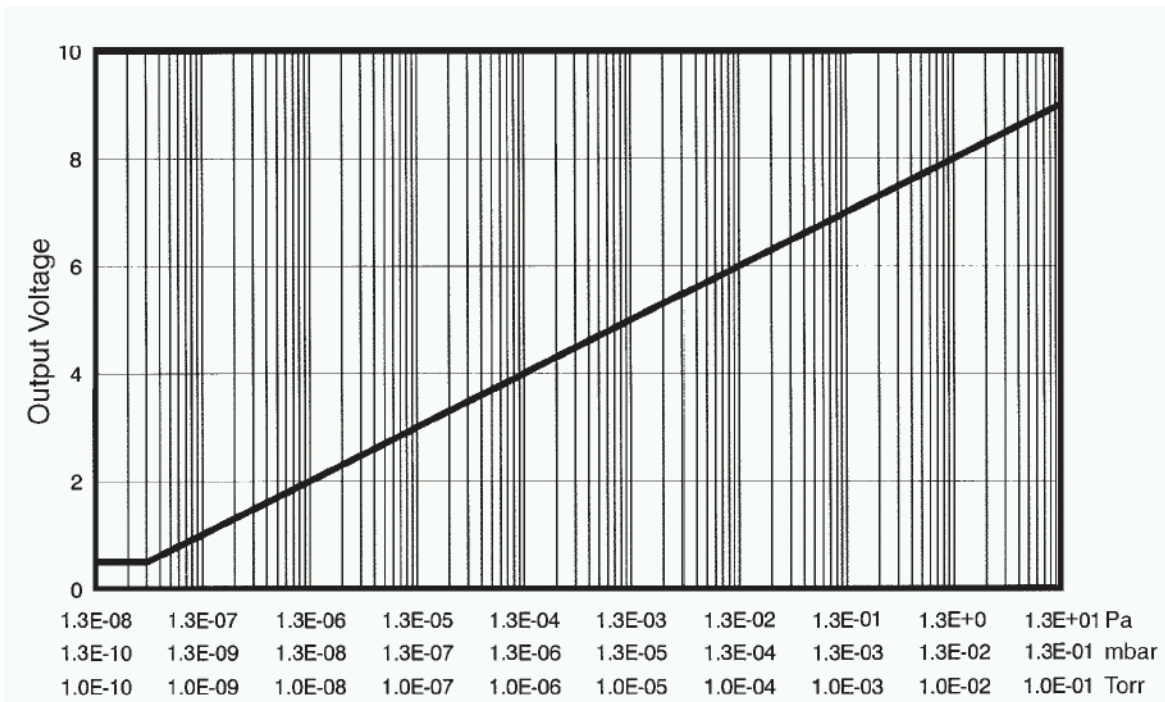


Figure 1-3 Output Voltage as a Function of Pressure

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Appendix A. Gas Correction Factor Table

Table A-1 on page A-2 lists the relative gauge gas correction factors for various gases.

WARNING



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

The values in Table A-1 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 readings of the Multi-Gauge Controller (normally calibrated for nitrogen):

- ❑ Enter the relative gas correction constant through the front panel key function **F GAS CORR.**

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 is affected by different gases which, in turn, are 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.

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Table A-1 Gas Correction Factor Table

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Acetaldehyde	C ₂ H ₄ O	2.6
Acetone	(CH ₃) ₂ CO	3.6
		4.0
		3.6
Acetylene	C ₂ H ₂	1.9
		2.0
Air		1.0
		0.98
Ammonia	NH ₃	1.3
		1.2
		1.3
Amylene:	ISO·C ₅ H ₁₀ CY·C ₅ H ₁₀	5.9
		5.8
Argon	Ar	1.3
		1.1
		1.2
		0.9
Benzene	C ₆ H ₆	5.9
		5.8
		5.7
		5.9
		6.0
Benzoic Acid	C ₆ H ₅ COOH	5.5
Bromine	Br	3.8
Bromomethane	CH ₃ Br	3.7
Butane:	n·C ₄ H 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 ₆ H ₅ Cl	7.0
Chloroethane	C ₂ H ₅ Cl	4.0
Chloroform	CHCl ₃	4.7
		4.8
		4.8
Chloromethane	CH ₃ Cl	2.6
		3.2
		3.1
Cyanogen	(CN) ₂	2.8
		3.6
		2.7
		2.7
Cyclohexylene	C ₆ H ₁₂	7.9
		6.4
Deuterium	D ₂	0.35
		0.38
Dichlorodifluoromethane	CCl ₂ F ₂	2.7
		4.1
Dichloromethane	CH ₂ Cl ₂	3.7
Dinitrobenzene	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 A-1 Gas Correction Factor Table (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·	1.5·C ₅ H ₁₀	6.4	Nitrous Oxide	N ₂ O	1.5 1.7 1.7 1.3 to 2.1
cyclo·	CY·C ₆ H ₁₀	6.0	Oxygen	O ₂	1.0 1.1 0.9 0.9
Hexane	C ₆ H ₁₄	6.6	Pentane		
Hexene:			n·	n·C ₅ H ₁₂	6.2 6.0 5.7
1·	1·C ₆ H ₁₂	5.9	ISO·	ISO·C ₅ H ₁₂	6.0
cyclo·	CY·C ₆ H ₁₀	6.4	neo·	(CH ₃) ₄ C	5.7
Hydrogen	H ₂	0.46 0.38 0.41 0.45 0.44	Phenol	C ₆ H ₅ OH	6.2
Hydrogen Bromide	HBr	2.0	Phosphine	PH ₃	2.6
Hydrogen Chloride	HCl	1.5 1.6 2.0 1.5	Potassium	K	3.6
Hydrogen Cyanide	HCN	1.5 1.6	Propane	C ₃ H ₈	4.2 3.7 3.7 to 3.9 3.6
Hydrogen Fluoride	HF	1.4	Propene oxide	C ₃ H ₆ O	3.9
Hydrogen Iodide	HI	3.1	Propene:		
Hydrogen Sulfide	H ₂ S	2.2 2.2 2.3 2.1	n·	n·C ₃ H ₆	3.3 3.2 to 3.7
Iodine	I ₂	5.4	cyclo·	cy·C ₃ H ₆	3.6
Iodomethane	CH ₃ I	4.2	Rubidium	Rb	4.3
Isoamyl Alcohol	C ₅ H ₁₁ OH	2.9	Silver perchlorate	AgClO ₄	3.6
Isobutylene	C ₄ H ₈	3.6	Sodium	Na	3.0
Krypton	Kr	1.9 1.7 1.7	Stannic iodide	SnI ₄	6.7
Lithium	Li	1.9	Sulphur Dioxide	SO ₂	2.1 2.3
Mercury	Hg	3.6	Sulphur Hexafluoride	SF ₆	2.3 2.8
Methane	CH ₄	1.4 1.5 1.6 1.4 to 1.8 1.5 1.5	Toluene	C ₆ H ₅ CH ₃	6.8
Methanol	CH ₃ OH	1.8 1.9	Trinitrobenzene	C ₆ H ₃ (NO ₂) ₃	9.0
Methyl Acetate	CH ₃ COOCH ₃	4.0	Water	H ₂ O	1.1 1.0 0.8
Methyl ether	(CH ₃) ₂ O	3.0 3.0	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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Appendix B. Specifications

Table B-1 lists the Eyesys Mini-IMG gauge controller specifications.

Table B-1 Specifications

Gauge Type	Inverted magnetron ion gauge Maximum operating voltage approximately 3 kV Measurement Range 5×10^{-3} Torr to 5×10^{-9} Torr
Measurement Range	5×10^{-3} Torr to 5×10^{-9} Torr
Power Requirement	24 VDC (10% @ 250 mA typical)
Output Signal	0.5 to +8.5 VDC Scaled 1 V/decade Signal ≤ 0.5 VDC indicates error (gauge tube/high vacuum on at atmosphere) When +24 VDC is applied with gauge tube off, output is above +9.0 VDC
Electrical Connection	9-pin D-subminiature
On-Board Indications	LED located on top of case next to 9-pin D-connector, red indicates the gauge is on.
On-Board Control	Gauge can be remotely turned on/off via pins 9 and 4 (analog GND) REMOTE ON/OFF PIN < .5 VDC = Gauge ON (High Voltage On) REMOTE ON/OFF 2.5 VDC = Gauge OFF (High Voltage OFF) When the REMOTE ON/OFF pin is left open (no applied voltage between pins 9 and 4), the gauge turns ON (HV ON) when +24 VDC power is applied.
Overpressure Limit	1500 Torr (2 Bar)
Overpressure Shutoff	100 mTorr
Temperature Limitations	Operating: 0 to 50° C (32 to 122° F) Storage: -15 to 70° C (5 to 158° F)
Vacuum Fittings Available	NW-25 KF NW-40 KF
Materials Exposed to Vacuum	300 series Stainless Steel Small amount of Nickel, glass (in feedthrough)
Electrical, Safety Certifications	UL, cUL recognized CE certified



*Request for Return
Health and Safety Certification*



- Return authorization numbers (RA#) **will not** be issued for any product until this Certificate is completed and returned to a Varian, Inc. Customer Service Representative.
- 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.
- Return product(s) to the nearest location:

North and South America

Varian, Inc.
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

- If a product is received at Varian, Inc. 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, Inc. employees occurring as a result of exposure to toxic or hazardous materials present in the product.

<i>CUSTOMER INFORMATION</i>			
Company name:			
Contact person:	Name:	Tel:.....
	Fax:	E-mail:
Ship method:	Shipping Collect #:	P.O.#:
Europe only: VAT Reg Number:		USA only: <input type="checkbox"/> Taxable	<input type="checkbox"/> Non-taxable
Customer ship to:	Customer bill to:
.....
.....

PRODUCT IDENTIFICATION

Product Description	Varian, Inc. Part Number	Varian, Inc. Serial Number

TYPE OF RETURN (check appropriate box)

<input type="checkbox"/> Paid Exchange	<input type="checkbox"/> Paid Repair	<input type="checkbox"/> Warranty Exchange	<input type="checkbox"/> Warranty Repair	<input type="checkbox"/> Loaner Return
<input type="checkbox"/> Credit	<input type="checkbox"/> Shipping Error	<input type="checkbox"/> Evaluation Return	<input type="checkbox"/> Calibration	<input type="checkbox"/> Other

HEALTH and SAFETY CERTIFICATION

VARIAN CANNOT ACCEPT ANY BIOLOGICAL HAZARDS, RADIOACTIVE MATERIAL, ORGANIC METALS, OR MERCURY AT ITS FACILITY. CHECK ONE OF THE FOLLOWING:		
<input type="checkbox"/> 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.		
<input type="checkbox"/> 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 (<u>Must be filled in</u>):		
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	Position	Parameters
<input type="checkbox"/> Does not start <input type="checkbox"/> Does not spin freely <input type="checkbox"/> Does not reach full speed <input type="checkbox"/> Mechanical Contact <input type="checkbox"/> Cooling defective	<input type="checkbox"/> Noise <input type="checkbox"/> Vibrations <input type="checkbox"/> Leak <input type="checkbox"/> Overtemperature <input type="checkbox"/> Clogging	<input type="checkbox"/> Vertical <input type="checkbox"/> Horizontal <input type="checkbox"/> Upside-down <input type="checkbox"/> Other
		Power: Rotational Speed: Current: Inlet Pressure: Temp 1: Foreline Pressure: Temp 2: Purge flow: Operation Time:
Describe Failure:		
Turbocontroller Error Message:		

ION PUMPS/CONTROLLERS

<input type="checkbox"/> Bad feedthrough <input type="checkbox"/> Vacuum leak <input type="checkbox"/> Error code on display	<input type="checkbox"/> Poor vacuum <input type="checkbox"/> High voltage problem <input type="checkbox"/> Other
Describe failure:	
Customer application:	

VALVES/COMPONENTS

<input type="checkbox"/> Main seal leak <input type="checkbox"/> Solenoid failure <input type="checkbox"/> Damaged sealing area	<input type="checkbox"/> Bellows leak <input type="checkbox"/> Damaged flange <input type="checkbox"/> Other
Describe failure:	
Customer application:	

LEAK DETECTORS

<input type="checkbox"/> Cannot calibrate <input type="checkbox"/> Vacuum system unstable <input type="checkbox"/> Failed to start	<input type="checkbox"/> No zero/high background <input type="checkbox"/> Cannot reach test mode <input type="checkbox"/> Other
Describe failure:	
Customer application:	

INSTRUMENTS

<input type="checkbox"/> Gauge tube not working <input type="checkbox"/> Communication failure <input type="checkbox"/> Error code on display	<input type="checkbox"/> Display problem <input type="checkbox"/> Degas not working <input type="checkbox"/> Other
Describe failure:	
Customer application:	

ALL OTHER VARIAN, INC.

<input type="checkbox"/> Pump doesn't start <input type="checkbox"/> Doesn't reach vacuum <input type="checkbox"/> Pump seized	<input type="checkbox"/> Noisy pump (describe) <input type="checkbox"/> Overtemperature <input type="checkbox"/> Other
Describe failure:	
Customer application:	

DIFFUSION PUMPS

<input type="checkbox"/> Heater failure <input type="checkbox"/> Doesn't reach vacuum <input type="checkbox"/> Vacuum leak	<input type="checkbox"/> Electrical problem <input type="checkbox"/> Cooling coil damage <input type="checkbox"/> Other
Describe failure:	
Customer application:	

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