D048-40-880
Issue F

Instruction Manual

Active Ion Gauge Controllers

Description	Item Number
IGC EBEAM, 2 Head, PCSP	D048-46-000
IGC EBEAM, 2 Head, EHVI	D048-47-000

EDWARDS
www.edwardsvacuum.com

Declaration of Conformity

We, Edwards
Manor Royal,
Crawley,
West Sussex RH10 9LW, UK

declare under our sole responsibility that the product(s)

Active Ion Gauge Controller	
IGC Ebeam PCSP	D048-46-000
IGC Ebeam EHVI	D048-47-000

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN61010-1:2001	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1: General Requirements.
EN61326-1:2006 (Class B Emissions)	Electrical Equipment for Measurement Control and Laboratory Use - EMC Requirements.

following the provisions of

2006/95/EC	Low Voltage Directive.
2004/108/EC	Electromagnetic Compatibility Directive.

L. G. Marini

Mr L Marini, Technical Manager

13-01-2009 Eastbourne

Date and Place

This product has been manufactured under a quality system registered to ISO9001

P200-03-060 Issue A

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dcs/7840/12/07

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For return of equipment, complete the HS Forms at the end of this manual.

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1 Introduction

1.1 Scope of this manual

This manual provides installation, operation and maintenance instructions for the Edwards Active Ion Gauge Controllers. Please read this manual before attempting to install and operate the Controller.

This manual contains essential safety information which supplements the safety features of the Ion Gauge Controller. Safety procedures are highlighted as WARNING and CAUTION instructions and you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.

WARNING

Warnings are given where failure to observe the instruction could result in injury or death to persons.

CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

The following symbol appears on the Controller:

From August 2005, Edwards will offer European customers a recycling service.

1.2 General

The active range of Ion Gauge Controllers comprises two models, allowing operation with PCSP or Edwards standard (EHVI) interface. The controllers operate from electrical supply voltages in the range 90 to 265 volts and frequencies between 45 and 70 Hertz.

The controllers may be used with gauge tubes incorporating tungsten or coated iridium filaments. Adjustments for degas power, filament power and gauge sensitivity are provided.

All variants interface with an EHVI Active Thermocouple or Pirani gauge and with certain EXC Turbo controllers, for independent protection of the ion gauge filament.

The controller can operate two gauges sequentially.

1.3 Models with PCSP interface

The controllers with parallel command/status ports (PCSP) are intended primarily for use in applications where the unit is to be interfaced to programmable logic controllers (PLCs) or other analogue-to-digital converters. Analogue output and control signal inputs are available at the PCSP socket on the rear panel.

1.4 Models with EHVI interface

Controllers equipped with the proprietary serial interface are intended for integration with the Edwards range of Active Gauge Controllers.

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2 Technical data

2.1 Pressure range

Both models	5 x 10^{-3} to 2 x 10^{-11} mbar
	(4 x 10^{-3} to 1.5 x 10^{-11} torr)

2.2 Mechanical data

Basic unit overall dimensions	88 x 202 x 260 mm
(w*h*d*)	(3.46 x 7.95 x 10.2 inches)
	(2U x 1/2 rack)
Weight (packed)	2.75 kg (6 lbs)
Weight (unpacked)	1.85 kg (4 lbs)

2.3 Operating conditions

Temperature range (operating)	10 ° to 50 °C (50 ° to 122 °F)
(Low pressure measurement performance impaired above 40 °C (104 °F))	
Temperature range (storage)	-20 ° to 70 °C (-4 ° to 158 °F)
Relative humidity (non condensing)	10% to 90%
Maximum operating altitude	2000 m
Installation category - IEC1010 (Ref: IEC 664/664A)	II
Pollution category - IEC1010	2
Enclosure rating	IP20 (BS5490) IP205 (IEC529)

2.4 Electrical supplies

Electrical supply requirements	
Supply voltage range	90 to 265 V a.c. auto-adjusting
Frequency	45 to 70 Hz auto adjusting
Power consumption (maximum)	150 W
Fuse rating	3.15 A (T)
Electromagnetic compatibility	EN50081-1
	EN50082-1
Filament	
Maximum voltage	8 V d.c.
Maximum current	5 A
Maximum power	40 W (adjustable limit)

Grid degas	
Maximum voltage	600 V d.c.
Maximum current	100 mA
Maximum power	60 W (adjustable limit)
Electrode potentials relative to ground	
Grid	210 V d.c. (600 in DEGAS mode)
Filament	43 V d.c. nominal
Collector	0 V (virtual earth)
Auxiliary gauge supply	
Voltage	24 V d.c.
Maximum current	100 mA

2.5 Electrometer amplifier

Voltage/pressure relation (See Section 4.3.1)	1 V/decade of pressure
(Logarithmic)	2 V = 1 x 10^{-10}
	V = (log10 P + 12)
Sensitivity adjustment range (See Section 4.1.2)	6 $mbar^{-1}$ to 26 $mbar^{-1}$
	(6 $Torr^{-1}$ to 26 $Torr^{-1}$)

2.6 PCSP interface

Socket connection	15 way female D-type

Inputs are active low (less than 3 V) with internal pull up resistors (150 kΩ) to 28 V. (See also Appendix A1).

2.7 EHVI interface

Socket connection	FCC68/RJ45 Type 8 way

2.8 Auxiliary (qualifying) gauge

Socket connection	FCC68/RJ45 Type 8 way

2.9 Gauge head A, B

Socket connection	7 way circular multipole

2.10 Electrical supply socket

IEC 320

3 Installation

WARNING

This appliance must be earthed. In addition to the electrical supply earth the chassis should be connected to vacuum system earth before the ion gauge is connected to it. The chassis earth is necessary because a plasma discharge in the gauge could result in the chassis reaching a high voltage should the electrical supply cable be removed.

WARNING

Switch off unit and disconnect from the electrical supply before removing the cover.

WARNING

Glass encapsulated ion gauge tubes, if handled roughly, can implode under vacuum resulting in flying glass which can injure personnel. Pressures above atmosphere can cause the ion gauge tube to explode, also causing flying glass. Proper cable strain relief and shielding guards surrounding the tube are recommended to prevent injury.

WARNING

Do not connect cable to gauge head unless gauge head is bolted to the vacuum system. Use only Ion Gauge connecting cables supplied by Edwards. Do not attempt to modify the instrument or gauge connecting cables.

CAUTION

Do not install the instrument in a manner which would restrict the airflow around the unit.

3.1 Unpacking and inspection

Remove all packing materials and protective covers and check the Ion Gauge Controller for damage. If the unit is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the unit together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the Ion Gauge Controller.

Check that your package contains the following items:

Qty	Description	Check (✓)
1	Ion gauge controller	❑
	Fitting pack, containing the following:-	❑
1	15 way "D" Type connector (PCSP only)	❑
1	15 way backshell for connector (PCSP only)	❑

If any of these items are missing, please notify your supplier in writing within 3 days.

If the Ion Gauge Controller is not to be used immediately, replace the protective covers and store it in suitable conditions, as described in Section 6.

3.2 Orientation

The unit may be freestanding on a flat surface, in this case the four mounting screws should be removed.

Alternatively the unit may be mounted in either a horizontal or vertical position, using the rack adapter accessory. The self adhesive plastic feet should be removed in this case. Further information is provided in Appendix A3.

Note: When mounting the unit in a rack ensure adequate clearance and ventilation so that the ambient temperature does not rise above 50 °C (122 °F). Do not obstruct the fan. Allow sufficient room at the back for the cables to follow a natural curve and be supported. The unit must NOT be mounted with the side panels (272 x 85 mm (10.7 x 3.4 inches)) in a horizontal orientation.

3.3 Degas settings

WARNING

High voltages exist within the unit when the power is switched on. All standard procedures for the safe handling of electricity must be observed. Servicing should only be carried out by qualified personnel.

3.3.1 Degas power adjustment

The maximum power is factory set to 40 watts. If another power setting is required proceed as follows:

Isolate the unit from the electrical supply. Disconnect the ion gauge cables. Remove the cover by undoing the five screws on the left hand side and two screws on the right hand side of the cover and lifting off. With reference to Figure 1 locate the Degas Power limit control, adjust the control to the required position using Table 1 as a guide. Replace the cover or see Section 3.3.2.

Table 1 - Degas limits

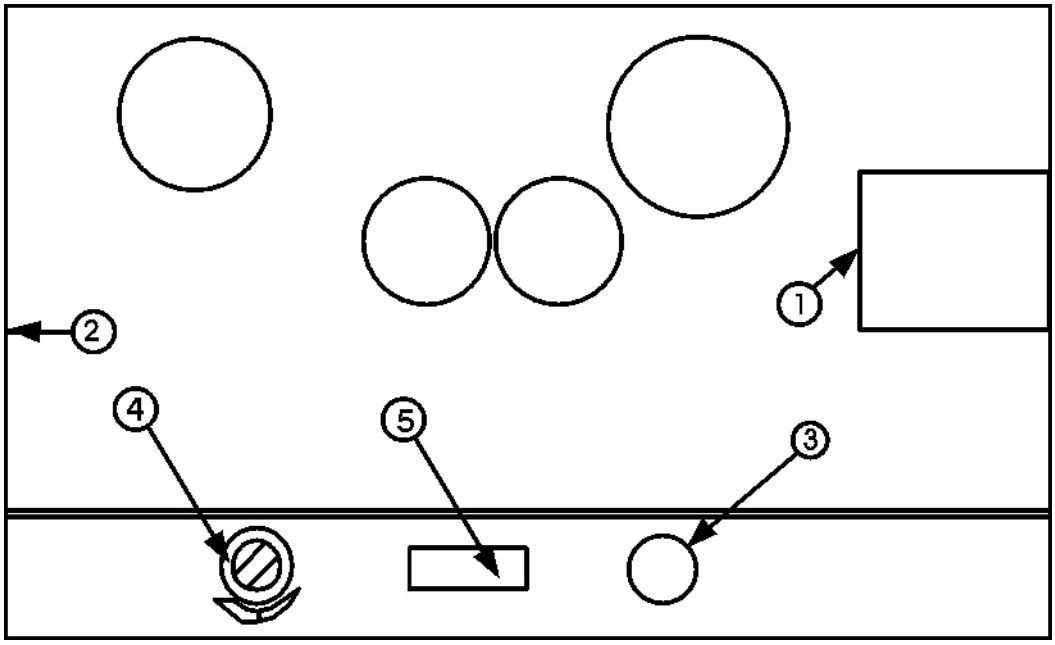
Control position	Degas limit
Low	20 W
Medium	40 W
High	60 W

3.3.2 Degas timed/continuous selection

The unit is factory set so that degas operates for a period of 10 minutes (after a 10 minute ramp period) and then automatically switches off. If automatic switch-off is not wanted, refer to Figure 1 and select “0" on switch Item 5 following the guidelines indicated in Section 3.3.1.

Replace the cover.

Figure 1 - View of PCB with cover removed



1. Electrical supply
2. Front
3. Fuse
4. Degas limit control
5. Timed/continuous degas selection

3.4 Filament power limit adjustment

The unit is factory set to allow a maximum filament power of 40 W. This is appropriate for most types of gauge tube since the filament power is regulated to maintain the selected emission current. If a lower power limit is required adjust the P fil Max control on the rear panel so that the slot aligns with the required value, see Figure 2. The scale indicates the power in Watts.

3.5 Connecting the cables

(Refer to Figure 2)

3.5.1 Earthing

When installing and operating an ion gauge head and its associated controller, take care to ensure that all parts of the equipment and the vacuum system have a correctly wired ground/earth connection.

If the vacuum system and ion gauge controller are not earthed correctly it is possible, under certain fault conditions, that the ion gauge chassis could become live in relation to the vacuum system.

WARNING

An incorrectly earthed product could prove fatal.

An appropriate high integrity ground/earth should be provided for the equipment and its ancillaries. If in doubt consult a qualified engineer for clarification. Refer to Appendix A2.

3.5.2 Electrical supply connection

Set the electrical power switch to off and connect the unit to the electrical supply using the appropriate supply lead. When using electrical supply cables which have been supplied without a plug it is essential that the wires are connected to a suitably rated electrical supply plug according to the standard convention:

Green/Yellow	Earth/Ground
Brown	Line/Live
Blue	Neutral

If required, connect the qualifying gauge to the AUX GAUGE I/P socket.

3.5.3 Ion gauge connections

Connect the ION gauge tube(s) to GAUGE A and/or GAUGE B power and signal sockets, using EHVI cables. Ensure that the cable does not exert any stress on the gauge by securing the cable to a rigid support near the gauge.

Before baking the vacuum system ensure that all cables are adequately rated to withstand the temperatures to be experienced.

3.5.4 EHVI interface models only

Connect the AGC to the EHVI socket.

3.5.5 PCSP interface models only

Connect the control and read out instrument to the PCSP socket. (Refer to Appendix A1).

4 Operation

WARNING

Ensure that the electrical installation of the Controller conforms with your local and national safety requirements. It must be connected to a suitably fused and protected electrical supply and a suitable earth point.

WARNING

The unit is not fail safe. The user must ensure that incorrect operation does not cause a hazard.

WARNING

In normal use the gauge filament operates at around 2000 °C (4000 °F) and may cause inflammable mixtures to explode.

WARNING

Do not attempt to modify the instrument or gauge connecting cables. Except for fuse replacement, do not attempt repair or recalibration of the instrument.

4.1 Gauge sensitivity constant

The sensitivity of the gauge tube is a measure of the current output for a given pressure. It depends on the design of the gauge tube and will be specified in the instructions provided with the gauge tube. Alternatively it can be found by calibrating the gauge tube against a reference tube.

Since only one sensitivity value can be set when two gauges are supplied from the same controller, they should be chosen to have the same sensitivity factor.

4.1.1 Setting the gauge sensitivity constant - models with EHVI interface

The procedure for setting the gauge sensitivity is described in the instructions for the Active Gauge Controller. The setting of the gauge constant control (located behind a blanking plug at the rear of the unit) is not relevant, but erroneous pressure indication will result if the control is adjusted after the Active Gauge Controller has been switched on.

4.1.2 Setting the gauge sensitivity constant - models with PCSP interface

The gauge sensitivity constant units must be the same units as those in which the pressure is to be displayed. For example if the pressure is to be displayed in mbar then the gauge sensitivity constant should be entered in units of $mbar^{-1}$.

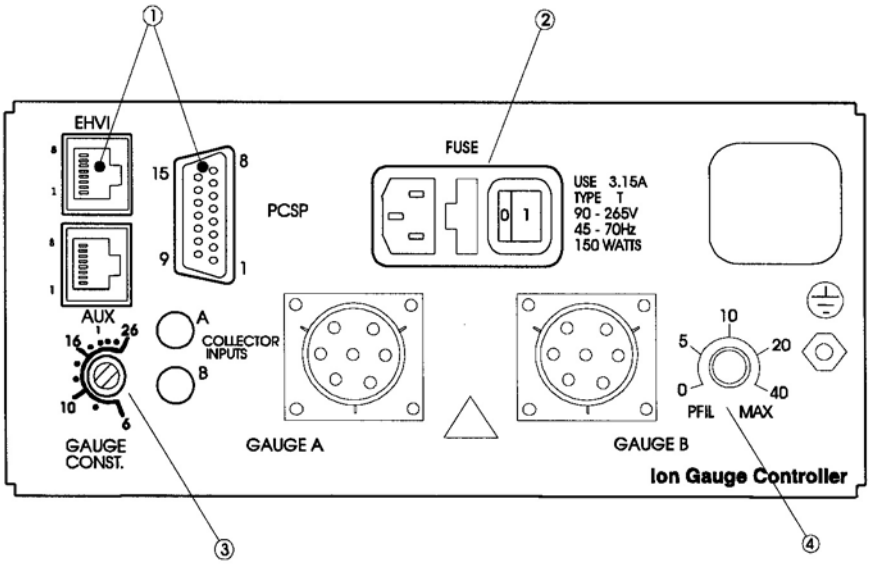
(To convert units of $torr^{-1}$ to $mbar^{-1}$, divide the torr values by 1.33).

(To convert units of $mbar^{-1}$ to $torr^{-1}$, multiply the mbar values by 1.33).

Method 1

Adjust the gauge constant control on the rear panel (See Figure 2) so that the slot aligns with the required value.

Figure 2 - Controller rear panel



1. If fitted
2. Electrical supply
3. Gauge constant control
4. Filament power control

4.1.2.1 Method 2 - Higher precision than method 1

Switch on the electrical supply at the rear panel (see Figure 2). At the PCSP socket switch pin 7 to connect with pin 15 (active low). The output between pins 13 and 14 (PCSP socket) now represents the gauge sensitivity constant. Refer to Table 2 to convert the voltage to the sensitivity constant. The units for gauge sensitivity must be the same as the units in which the pressure is to be displayed.

Disconnect pin 7 from pin 15. The output between pins 13 and 14 reverts to pressure indication.

Table 2 - Sensitivity adjustment

Gauge sensitivity	Output volts V
6	0.18
8	2.13
10	3.60
12	4.82
14	5.58
16	6.75
18	7.54
20	8.24
22	8.87
24	9.46
26	10.00

4.2 Measuring pressure - models with EHVI interface

For units with EHVI interface, refer to AGC instructions (D396-50-880).

4.3 Measuring pressure - models with PCSP interface

Note: *All pin locations apply to the PCSP socket on the rear panel.*

4.3.1 Pressure display

The pressure signal is displayed between pins 13 (positive) and 14 (negative) unless pin 7 is connected to pin 15. (See also Section 4.1.2).

The voltage is related to the pressure by the equations:

$$V = (\log_{10} P + 12)$$

$$P = 10^{(V-12)}$$

For example:

At a pressure of 10^{-3} mbar the output is 9 volts (gauge sensitivity set in $mbar^{-1}$)

At a pressure of 10^{-9} torr the output is 3 volts (gauge sensitivity set in $torr^{-1}$)

4.3.2 Gauge head selection

Disconnect pin 1 from pin 15 for selection of gauge A.

Connect Pin 1 to pin 15 (active low state) for selection of gauge B.

Before changing the gauge head selected switch off the emission as described in Section 4.3.4.

4.3.3 Filament selection

Disconnect Pin 9 from pin 15 for selection of filament 1.

Connect Pin 9 to pin 15 (active low state) for selection of filament 2.

Switch off the emission as described in Section 4.3.4, before changing the filament.

4.3.4 Emission selection

The emission current can be switched ON/OFF and changed by connecting pins 2 and/or 3 to pin 15 in accordance with Table 3. YES indicates connection to pin 15 (active low state), NO indicates no connection.

For example, to switch off the emission disconnect pins 2 and 3 from pin 15.

Table 3 - Emission current selection - PCSP models

Pin 2	Pin 3	Gauge emission current
NO	NO	OFF
YES	NO	0.1 mA
NO	YES	1 mA
YES	YES	10 mA

The low emission current will provide the best accuracy at high pressure because the gauge sensitivity factor of some tubes reduces when they are used at high pressure and high emission.

The high emission current will optimise the signal to noise ratio when operating at low pressure.

Table 4 indicates the preferred emission currents for the gauge tubes specified in Section 7.

Table 4 - Preferred emission setting

Pressure torr/mbar	Emission current mA
Above 10^{-4}	0.1
10^{-8} - 10^{-4}	1.0
below 10^{-8}	10.0

An open collector transistor output between pins 6 and 15 conducts to provide a signal that can be used to interface with a PLC or to drive a lamp or relay indicating that emission has been established. Typical configurations are shown in Appendix A1.

4.4 Degassing the gauge tube grid

4.4.1 Background

To reduce the amount of gas generated by the ion gauge it is possible to raise the temperature of the gauge anode (or grid) to red hot and so degas it.

The degas operation is recommended whenever a new tube is used, when very low pressures are to be measured or if a gauge has been at atmosphere for a long period. Excessive gas desorbtion rates are avoided by automatic ramping of the degas power over the first ten minutes.

Depending on user preference, degas will continue until de-selected or switch off automatically after 20 minutes (see Section 3.3.2).

Degas the gauge when the pressure has fallen below 10^{-5} mbar. The degas process is inhibited unless the pressure is below 4 x 10^{-5} mbar. It will switch off if the pressure rises above 1 x 10^{-4} mbar. Provided the filament has not tripped off degas will automatically continue when the pressure has reduced. If the pressure perpetually rises rapidly, causing degas or emission to switch off, then a lower degas power setting may be required.

4.4.2 Operation - models with EHVI interface

The method of actuating degas is described in the Active Gauge Controller Instructions.

4.4.3 Operation - models with PCSP interface

Degas is enabled when pin 4 is momentarily connected to pin 15 (active low state) at the PCSP interface socket. A minimum time of 30 milliseconds is required to change the state of degas. Degas is disabled when pin 4 is again momentarily connected to pin 15 (active low state) at the PCSP interface socket.

An open collector transistor output between pins 5 and 15 conducts to provide a signal that can be used to interface with a PLC or to drive a lamp or relay indicating that degas is operating. Typical configurations are shown in Appendix A1.

4.5 Filament protection

4.5.1 By pressure

The filament will switch off if the pressure is, or rises above 9 x 10^{-3} mbar (7 x 10^{-3} torr). To switch the filament back on when pressure has been reduced select filament off and reselect required emission level - refer to Section 4.3.4.

4.5.2 By emission

Emission proving is initiated on start-up whereby the filament power is ramped to a maximum of 30 Watts (depending on filament power limit setting) and applied for a maximum of 5 seconds during which time emission is expected. If emission is detected the unit switches to its normal operating mode which maintains the selected emission current. If, however, emission current is not established the unit transfers to the lockout state. This state prevents further operation of the unit until the emission selection is returned to the 'OFF' state which resets the lockout latch.

A number of factors may prevent emission being established, the most common being poor emission sensitivity due to filament contamination (coated filament) or open circuit filament.

The unit may lockout if a short circuit develops within the gauge tube.

4.5.3 By power limit

The maximum power which can be supplied to the filament is set by the P fil Max control on the rear panel. For some types of gauge tube it may be necessary to reduce this control from its factory setting of 40 W to provide additional protection for the filament.

4.5.4 By a qualifying gauge

The presence of a connection between pins 2 and 5 of the auxiliary connector enables the qualifying gauge function within the IGC. This function inhibits emission until pin 6 is connected to pin 2. These requirements are produced by the active gauges described below. However these requirements may also be provided by external controllers or circuitry.

An Edwards active pirani, thermocouple, or some EXC series turbo controllers may be used to qualify the controller. If a gauge is connected to the AUX socket, emission is inhibited until the pressure has fallen below the set point selected on the gauge. See gauge instructions for information on set point adjustment. If a turbo controller is connected to the AUX socket, emission is inhibited until the turbomolecular pump has reached normal speed.

Suitable gauges:	APG - L - NW16	D021-73-000
	APG - M - NW16	D021-71-000
	ATC - E	D351-08-000
	with ATC - M	D355-13-000

Note: *The above gauges are suitable because they have pressure trip levels below the upper pressure limit of the ion gauge. APG type gauges with other mechanical options are also compatible.*

4.6 Recorder output

For models with EHVI interface it is possible to monitor the ion gauge pressure using the Active Gauge Controller chart recorder output. The output does not take into consideration the sensitivity of the ion gauge so that a correction may be required. The pressure is derived using the relationship:

$$P = (10^{(V-12)}) \frac{.10}{S}$$

where V is the recorder output voltage and S is the gauge sensitivity in the same units for which the pressure is to be displayed.

For models with PCSP interface the voltage output will not require correction provided that the gauge sensitivity constant control is set correctly. If the control is not set to the gauge sensitivity (for example if external correction is employed) then the pressure can be derived using the relationship:

$$P = (10^{V-12}) \frac{^{S}IGC}{S}$$

where V is the PCSP analogue output voltage, ^{S}IGC is the setting on the IGC gauge constant control and S is the true gauge sensitivity.

5 Maintenance

WARNING

Ensure that maintenance is carried out by a suitably trained and supervised technician. Obey your local and national safety requirements.

WARNING

Switch off unit and disconnect from the electrical supply before removing the cover.

CAUTION

Do not attempt to modify the instrument or gauge connecting cables. Do not attempt repair or recalibration of the instrument, there are no internal user serviceable parts.

There are no user serviceable parts associated with the IGC other than fuse replacement.

5.1 Fuse replacement

5.1.1 Electrical supply fuse replacement

The electrical supply fuse holder is an integral part of the electrical supply plug and switch assembly, positioned between the switch and the electrical supply connector (see Figure 2). Pull up the centre section which forms the fuse holder. Replace the fuse with a 3.15 A type T fuse.

5.1.2 Internal fuse replacement

This fuse should be replaced only when the cause of the failure has been identified and removed. Failure may be associated with an external short circuit on the 24 V supply, for example due to a damaged interconnecting cable.

Disconnect all electrical connections from the rear of the unit.

Remove the cover. Replace the internal plug in fuse (Figure 1, item 3) with a 315 mA type T fuse. Replace the cover and the electrical connections.

5.2 Maintenance schedule

The grounding described in Section 3.5 must be checked annually and whenever the equipment has been disturbed or reconfigured. See Appendix A2.

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6 Storage and disposal

6.1 Storage

Store the controller in a cool dry place. Do not exceed the conditions specified in Section 2.

6.2 Disposal

Dispose of the Controller in accordance with local and national safety requirements.

Alternatively, you may be able to recycle the Controller and/or cables; contact Edwards or your supplier for advice (also see below).

The Controller and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment, 2002/96/EC. From August 2005, Edwards will offer European customers a recycling service for the Controller/cables at the end of the product's life. Contact Edwards for advice on how to return the Controller/cables for recycling.

WARNING

Do not incinerate the controller. Incineration may cause emission of noxious fumes and metal cased capacitors my explode due to build up of internal pressure.

WARNING

The cable for use with electron bombardment degas nude gauge tubes incorporates PTFE and should not be incinerated without taking special precautions.

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7 Spares and accessories

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Brazil, Canada, France, Germany, Great Britain, Hong Kong, Italy, Japan, U.S.A, and a world wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from your nearest Edwards company or distributor. When ordering, please state for each part required:

- Model and Item Number of your equipment
- Serial number (if any)
- Item number and description of part

7.2 Accessories and spares

The following accessories and spares are available from Edwards High Vacuum International.

7.2.1 Rack adapter

Rack adapter	D048-30-300

7.2.2 Ion gauge tubes and cables

1. Nude gauge tubes - NW35CF (2 3/4 inch Conflat®)
X-Ray limit = 10^{-11} mbar

Description		**Item number**
Dual tungsten filament		D029-99-380
Dual iridium filament		D029-99-390
cables for above tubes (bakeable to 250 °C):		
2 m	(6.5 feet)	D048-47-060
3 m	(10 feet)	D048-47-100

2. Nude gauge tubes - NW35CF (2 3/4 inch Conflat®)
X-Ray limit = 10^{-10} mbar

Description		**Item number**
Dual tungsten filament		D029-98-380
Dual iridium filament		D029-98-390
Cables for above tubes:		
1.8 m	(6 feet)	D048-46-060
3 m	(10 feet)	D048-46-100

3. Glass encapsulated tubes

Description		Item number
Dual tungsten filament 3/4 inch port, Kovar		D029-98-010
Thoria/iridium filament 3/4 inch port Kovar		D029-98-040
Dual tungsten filament 1 inch port, Kovar		D029-98-070
Thoria/iridium filament 1 inch port, Kovar		D029-98-110
Dual tungsten filament		
2 3/4 inch Conflat® 3/4 inch port, Kovar		D029-98-140
Thoria/iridium filament		
2 3/4 inch Conflat® 3/4 inch port, Kovar		D029-98-170
Cables for above tubes:		
1.8 m	(6 feet)	D048-31-060
3 m	(10 feet)	D048-31-100

7.2.3 Qualifying gauges

Description	Item number
APG - L - NW16	D021-73-000
APG - M - NW16	D021-71-000
ATC - E	D351-08-000

Note: *APG type gauges with other mechanical options are also compatible.*

7.2.4 Qualifying gauge cables / EHVI interface cables

Cable length		Item number
0.5 m	18 inches	D400-01-005
1 m	3 feet	D400-01-010
3 m	10 feet	D400-01-030
5 m	15 feet	D400-01-050
10 m	30 feet	D400-01-100
15 m	50 feet	D400-01-150
30 m	80 feet	D400-01-250
50 m	150 feet	D400-01-500
100 m	325 feet	D400-01-999

7.2.5 Electrical supply cables

IEC - unterminated (2 metre - 6 feet)	D400-13-020
IEC - terminated with USA plug (2 metre - 6 feet)	D400-13-120

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Appendix A1 Interfaces and connectors

A1.1 PCSP interface

PCSP interface 15 way female D-Type

Command port 'n' is active low and considered to be connected to the common port (pin 15) when the voltage between port 'n' and pin 15 is less than 3 volts.

PCSP command ports are internally connected to a 24 volt supply through a 150 kΩ resistor. The port is active low and may be considered connected to pin 15 when the external resistance between the port and pin 15 is less than 18 kΩ.

Figure A1 - PSCP connector

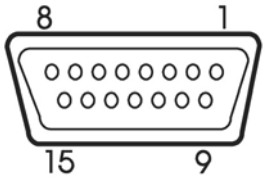
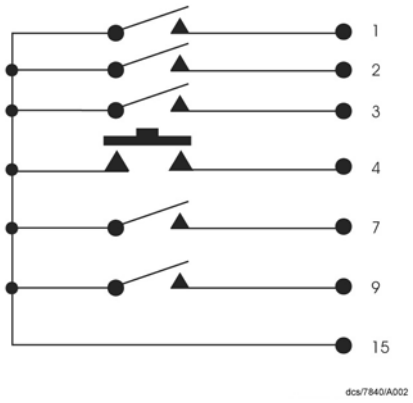


Table A1 - PCSP connector

Socket connection	Control function
1	Gauge head select input (low = head B)
2	Gauge emission select input (see Table 3)
3	Gauge emission select input (see Table 3)
4	Degas enable input (toggle ON/OFF)
5	Degas OK output
6	Emission OK output
7	Analogue output select
8	No connection
9	Filament select (low = filament 2)
10	Qualifying gauge signal common
11	Qualifying gauge signal or set-point
12	Qualifying gauge pressure/set-point control
13	Analogue output positive
14	Analogue output negative (not ground)
15	Control common.

Figure A2 - PCSP socket pins

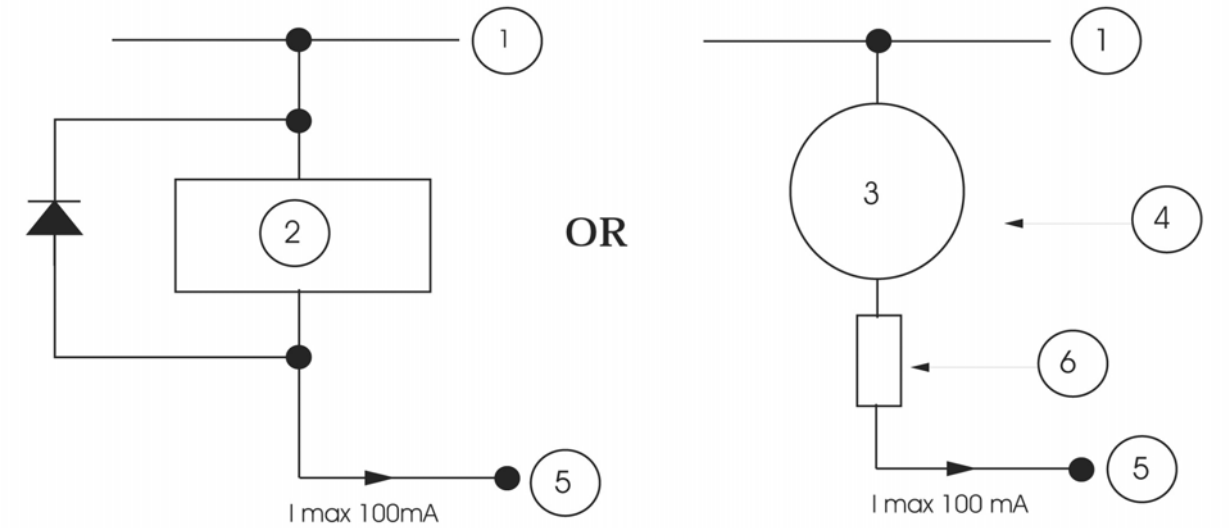


1. Head select
2. Emission select 1
3. Emission select 2
4. Degas enable
7. Output select
9. Filament select

A1.2 PCSP command operation

The following diagrams show possible ways in which the PCSP outputs can be connected to control an external device such as a relay to provide status information.

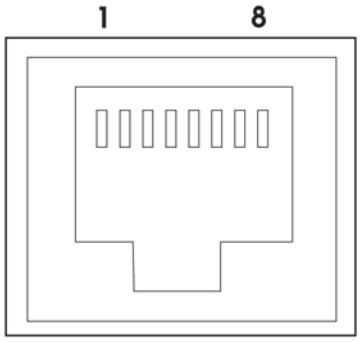
Figure A3 - PCSP status indication



1. + 24 Volts nominal (relative to pin 15)
2. Relay
3. LED
4. This may be the opto-isolated input of a plc
5. Pin 6 (emission) Pin 5 (degas)
6. Current limiting resistor

A1.3 EHVI interface

Figure A4 - EHVI interface

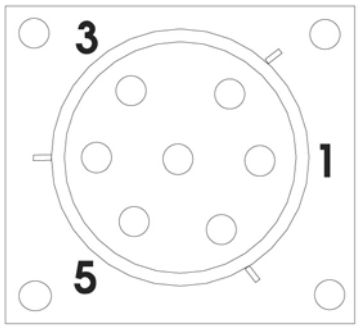


Socket connection	FCC68/RJ45 Type 8 way

Pin allocation	Control function
1	No connection
2	Control signal ground
3	Analogue output positive
4	Gauge identification output
5	Analogue ground
6	Control signal # 1 input
7	Control signal # 2 input
8	No connection

A1.4 Ion gauge interface

Figure A5 - Ion gauge interface

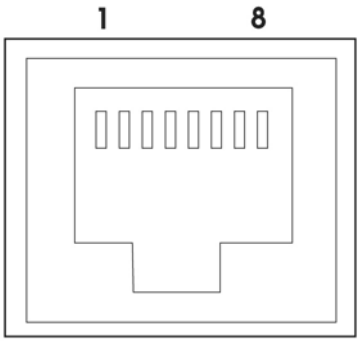


Socket connection	7 way circular multiple

Pin allocation	Control function
1	Filament # 2
2	Grid
3	Grid
4	Filament common
5	Filament common
6	Filament # 1
7	Screen

A1.5 Qualifying gauge interface

Figure A6 - Qualifying gauge interface



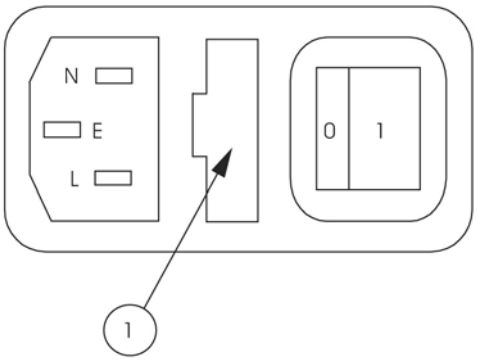
Socket connection	FCC68/RJ45 Type 8 way

Pin allocation	Control function
1	Power supply positive voltage
2	Power supply common
3	No connection
4	No connection
5	Enable qualifying function (active low)
6	Enable emission (active low)
7	No connection
8	No connection

Note: *Active low is defined as a voltage less than 3 V with respect to power supply common.*

A1.6 Electrical supply connector

Figure A7 - Electrical supply connector



1. Fuse

L. Line/live
N. Neutral
E. Earth

Appendix A2 Recommended earth bonding

The vacuum chamber and the earth terminal on the rear panel of the IGC should be connected to a common earth junction, typically in the power distribution box. The earth bonding impedance of these conductors should be of low impedance (less than 0.1 ohms).

Note: *It is not possible to check the bonding impedance using standard multimeters - THE CORRECT EARTH BONDING MEASUREMENT EQUIPMENT MUST BE USED.*

Checking procedure:

1. Physically inspect the earthing arrangements of the controller and the system.
2. Inspect and ensure that the vacuum system and its components are grounded by heavy duty cable (remember that the O-rings may cause breaks in earth continuity).
3. Measure the potentials between the ion gauge chassis and the vacuum system during commissioning to ensure that the bonding is satisfactory. Potential differences of less than 1 volt a.c. or d.c. are expected.

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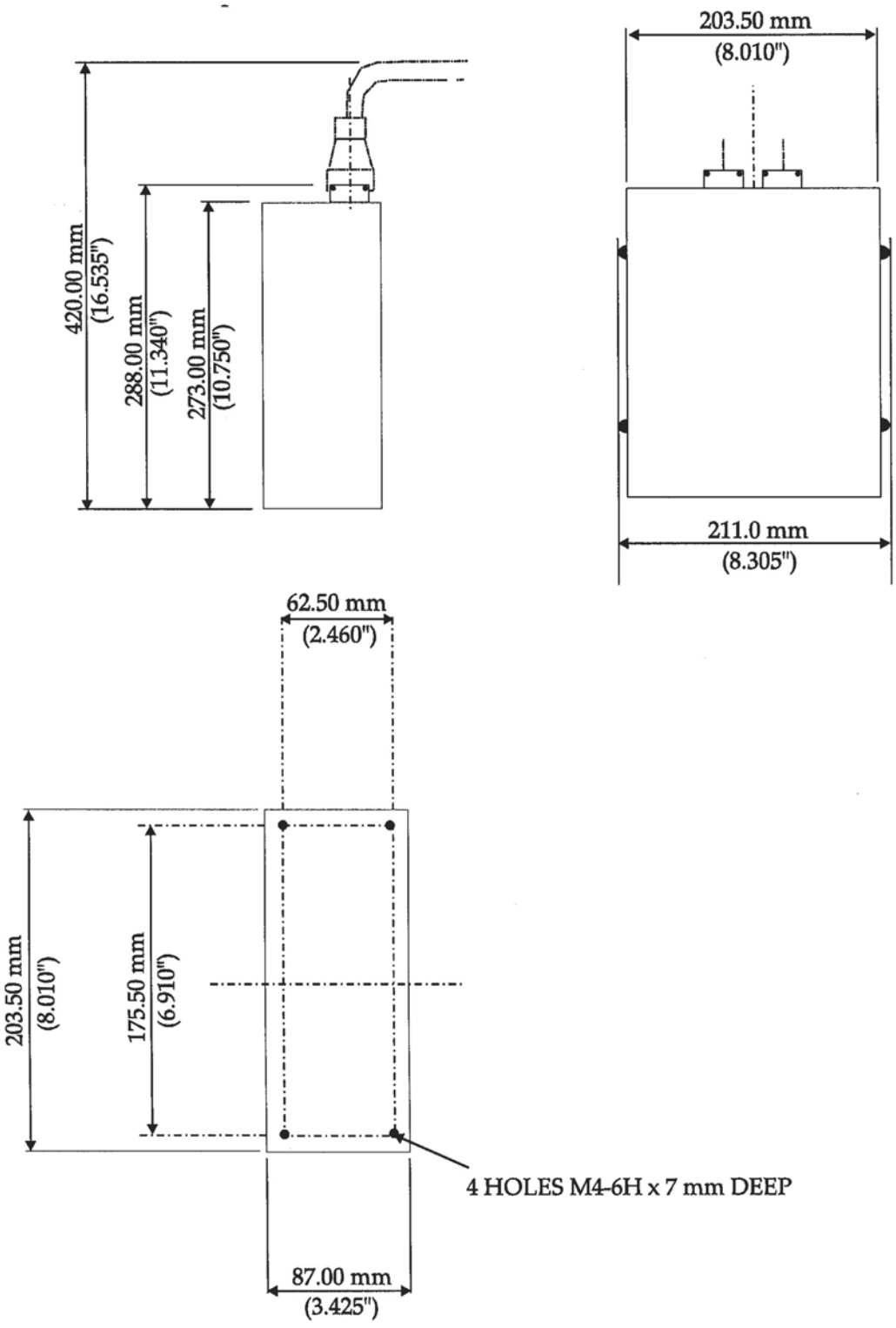
Appendix A3 Installation requirements

Figure A8 - Installation requirements



Appendix A3

Figure A9 - Rack mounting dimensions