



# IG40 BA AND EX LOW PRESSURE PASSIVE GAUGES INSTRUCTION MANUAL

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Original Instructions



# Declaration of Conformity

We, Edwards,  
Innovation Drive,  
Burgess Hill,  
West Sussex,  
RH15 9TW, UK

declare under our sole responsibility, as manufacturer and person within the EU authorised to assemble the technical file, that the product(s)

- Ion (IG 40) gauges connected to controllers (PGC).

D03000300 IG40 BA DN40CF +  
D03000310 IG40 EX DN40CF +  
D03000410 PGC202 Pirani/Ion Contr +\*

D03000301 IG40 BA/EX cable 5 m bakeable +  
D03000302 IG40 BA/EX cable 10 m bakeable +  
D03000305 IG40 BA/EX cable 50 m bakeable +

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

EN61010-1:2010 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. General Requirements

EN61326-1:2013 Class B, Industrial Electrical equipment for measurement, control and laboratory Use. EMC requirements. General requirements

and fulfils all the relevant provisions of

(+) 2014/35/EU Low Voltage Directive  
(\* ) 2014/30/EU Electromagnetic Compatibility (EMC) Directive  
2011/65/EU Restriction of Certain Hazardous Substances (RoHS) Directive  
2012/19/EU Waste from Electrical and Electronic Equipment (WEEE) Directive

*Note: This declaration covers all product serial numbers from the date this Declaration was signed onwards.*

Larry Marini, Senior Technical

07.06.2017, Eastbourne

Date and Place

*This product has been manufactured under a quality management system certified to ISO 9001:2008*

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# Safety

## Symbols used

### Symbols for residual risks



#### **WARNING:**

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



#### **CAUTION:**

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

## Personnel qualifications

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed.

## General safety instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
- Consider possible reactions with the product materials.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

## Responsibility and warranty

Edwards will not assume any responsibility or warranty in cases where the operator or third persons:

- Do not observe the information given in this document.
- Do not use the product as intended.
- Modify the product in any way (conversions, repair work, etc).

- Operate the product with accessories not listed in the corresponding product documentation.

Subject to technical alterations without prior notice. The figures are not binding.



## Description

The IG40 BA is a Bayard-Alpert measurement system and the IG40 EX is an extractor measurement system. Operation of these sensors is based on the hot cathode ionisation effect.

The temperature resistant gauge head cable must not be exposed to a temperature exceeding 200 °C maximum (250 °C at the flange of the sensor).

## Product identification

A nameplate is located on the protection cover. When communicating with Edwards, stating the information on the nameplate is necessary.

## Validity

This document applies to products with part numbers

Product Description	Item number
IG40 BA DN40CF Bayard-Alpert Ion Gauge	D03000300
IG40 EX DN40CF Extractor Ion Gauge	D03000310
IG40 BA / EX cable 5 m Bakeable	D03000301
IG40 BA / EX cable 10 m Bakeable	D03000302
IG40 BA / EX cable 50 m Bakeable	D03000303

## Intended use

The IG40 BA and EX may only be used for the measurements of total pressures in vacuum systems and only when connected to a PGC202 vacuum gauge controller instrument.

# Technical data

## General gauge head data

Table 1 General gauge head data

Description	IG40 BA	IG40 EX
Materials		
Lead-in pins	NiFe	
Insulator	Al <sub>2</sub> O <sub>3</sub> ceramic, glazed	
Pin sealing plate	NiFe	
Flange	Stainless steel	
Cathode	Iridium with yttrium oxide coating	
Anode	Pt/Ir 90/10 and Mo/Pt wrapped wire	Mo and CoNiCr
Collector	Tungsten	
Reflector		NiFe
Flange connection	DN 40 CF	
Electrode system configuration	Bayard-Alpert	Extractor system
Ambient temperature during operation	20 to 80 °C	
Maximum flange temperature with bakeable gauge cable	250 °C	
Maximum bakeout temperature (with no cable connected)	400 °C	
Maximum recommended rate of temperature change during bakeout	5 °C per minute	
Storage temperature	20 to 50 °C	
Relative humidity		
Annual average	≤ 65% (non-condensing)	
On 60 days	≤ 85% (non-condensing)	
Use	Indoors (altitude 2000 m maximum above sea level)	
X-ray limit	< 1 x 10 <sup>-11</sup> mbar (hPa)	< 1 x 10 <sup>-12</sup> mbar (hPa)
Upper limit of measuring range	1 x 10 <sup>-2</sup> mbar (hPa)	1 x 10 <sup>-4</sup> mbar (hPa)
Lower limit of measuring range	2 x 10 <sup>-11</sup> mbar (hPa)	2 x 10 <sup>-12</sup> mbar (hPa)

**Table 2 Bakeable gauge head cable**

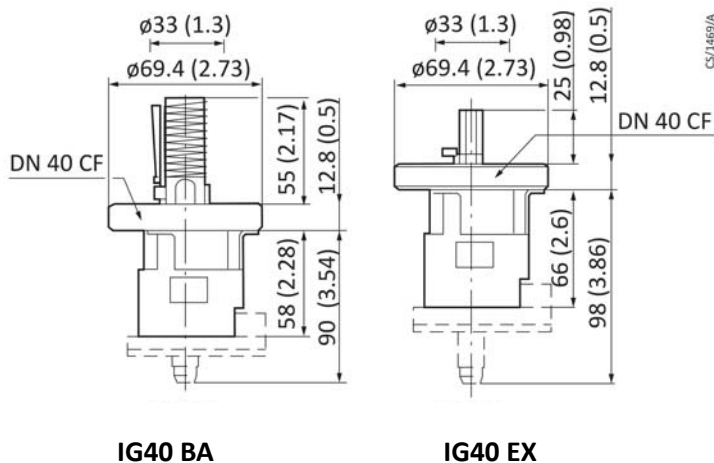
Description	Value
Maximum bakeout temperature	200 °C
Recommended rate of temperature change	5 °C per minute
Insulation materials used	PTFE, PEEK
Length	5, 10 or 50 m

**Table 3 Operating characteristics when used with control unit PGC202**

Description	IG40 BA	IG40 EX
Collector potential	0 V	
Cathode potential	+80 V	+100 V
Anode potential	+220 V	+220 V
Reflector potential	-	+205 V
Emission current range	100 μA, 10 mA	1.6 mA
Cathode heater current	1.5 A (typical)	
Cathode heater voltage	3 V (typical)	3.7 V (typical)
Sensitivity for nitrogen	17 mbar <sup>-1</sup> (hPa <sup>-1</sup> ) (typical)	6.25 mbar <sup>-1</sup> (hPa <sup>-1</sup> ) (typical)
Maximum bake-out power	90 mA/480 V	45 mA/480 V

## Dimensions

**Figure 1 Dimensions**



# Installation

## Supplied equipment

Table 4 Gauges

Description	Quantity
Gauge	1
Operating manual	1

Table 5 Bakeable gauge head cable

Description	Quantity
Bakeable gauge head cable	1
Housing with cover	1
Ion collector cable	1
Countersunk screws	2
Operating manual	1

## Assembly



### WARNING:

Installation, mounting and removal may only be carried out with the operating unit switched off.



### WARNING:

As a rule, all ionisation measurement systems must only be operated in connection with a properly earthed pump system.

When mounting the gauge head to the vacuum system, ensure that the gauge is not subjected to mechanical oscillations, vibrations or impacts.

Do not install a vent valve in the immediate vicinity of the gauge head. Sudden changes in air flow may result in mechanical damage to the sensitive cathode. The mounting position of the gauge head has no influence on the correct operation.

When installing several gauge heads at one common component (T-piece or cross for example) an optical separation is required. The gauge heads must not be in direct line of sight of each other. Interactions may cause incorrect measurements.



### Note:

*Humidity at the insulators (Figure 2 item 14) caused by condensing water for example, can give rise to incorrect measurements due to leakage currents.*

## Connecting the bakeable gauge head cable.



### WARNING:

If during operation the IG 40 BA/EX suffers a malfunction then a live voltage maybe present at the gauge head measurement signal connection.

Affix the touch protection component at the BNC plug on the bakeable gauge head cable after it is connected to the PGC202 and before the PGC202 is switched on. The touch protection component is supplied together with the gauge head cable.



### WARNING:

Switch the gauge off first before working at the gauge cable. After switching off, wait for at least 15 seconds.

## Preparing the gauge head for the connection of the bakeable gauge head cable

Remove the plug guide (Figure 2 item 4) by unscrewing the cylinder head screws (Figure 2 items 5 and 6) from the gauge head (Figure 2 item 1).

The IG40 EX gauge head has been designed with a greater distance between gauge head flange (Figure 2 item 1) and plug guide (Figure 2 item 4).

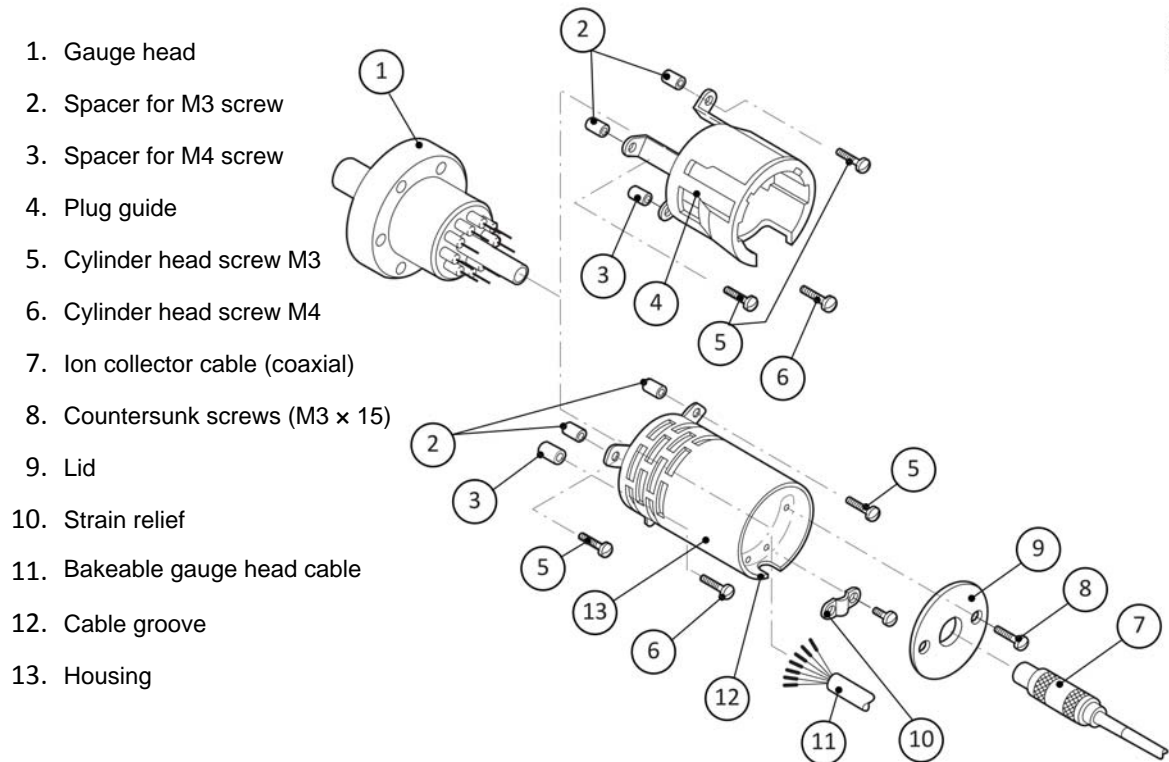
For this reason three spacers have been fitted between gauge head flange (Figure 2 item 1) and the plug guide (Figure 2 item 4). Do not loose the 3 spaces as these are required when installing the bakeable gauge head cable. Positioning of the plug guide is defined through the different bolt diameters on the gauge head (Figure 2 item 1).



### Note:

*The bakeable gauge head cable may also be connected after the gauge head has already been installed.*

Figure 2 Gauge head connection



1. Gauge head
2. Spacer for M3 screw
3. Spacer for M4 screw
4. Plug guide
5. Cylinder head screw M3
6. Cylinder head screw M4
7. Ion collector cable (coaxial)
8. Countersunk screws (M3 × 15)
9. Lid
10. Strain relief
11. Bakeable gauge head cable
12. Cable groove
13. Housing

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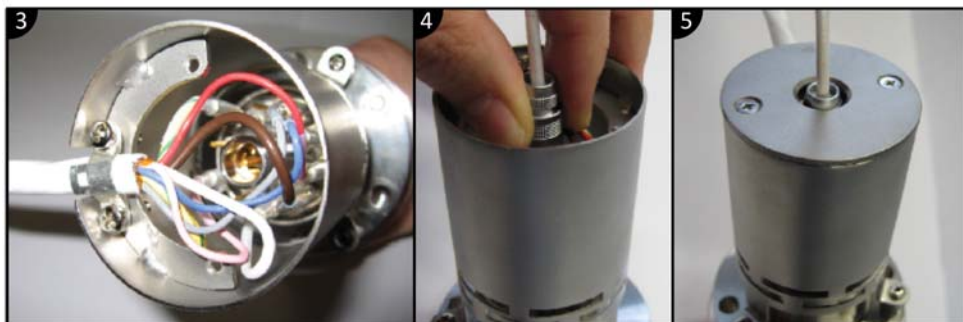
## Connecting the bakeable gauge head cable to the flange on the gauge head



### CAUTION:

Especially note the pin assignment. Provide the connection with great care. Do not subject the pin contacts to any bending forces (Risk: damaging of the current feed-through/leak).

1. Pull the cover (Figure 2 item 9) and then the housing (Figure 2 item 13) over the bakeable gauge head cable (Figure 2 item 11) so the connection sockets can be fitted to the gauge head (Figure 2 item 1).
2. Connect the bakeable gauge head cable to the gauge head as depicted in Figure 3. The individual wires of the gauge head cable are colour-coded.



CS/1471/A

3. Bolt the housing (Figure 2 item 13) onto the gauge head flange (Figure 2 item 1) with the bolts (Figure 2 items 5 and 6) and, in the case of the IG40 EX only, the 3 spacers

(Figure 2 items 2 and 3). Secure the entire cable with the strain relief (Figure 2 item 10).

4. Now the ion collector cable (Figure 2 item 7) can be inserted at the centre of the gauge head.
5. Secure the cover (Figure 2 item 9) with the bolts (Figure 2 item 8).

### Fitting the gauge head including the bakeable gauge head cable

The gauge head including the bakeable gauge head cable can be now inserted into the vacuum chamber and bolted on.



**Note:**

*Before connecting, Edwards recommends pumping down the system and if possible running a vacuum test or a direct leak search.*

For removing or replacing the gauge head proceed in the reverse order. The plug must be unlocked in the gauge head housing, and for this reason unscrew the cover (Figure 2 item 9) first.

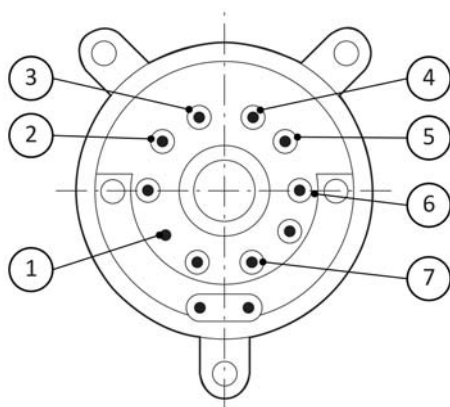
**WARNING:**



If during operation the IG 40 BA/EX suffers a malfunction then a live voltage maybe present at the gauge head measurement signal connection.

Affix the touch protection component at the BNC plug on the bakeable gauge head cable after it is connected to the PGC202 and before the PGC202 is switched on. The touch protection component is supplied together with the gauge head cable.

Figure 3 View onto the gauge head



CS/1472/A

Pin	Colour	IG40 EX	IG40 BA
1	yellow/green	LP*	LP*
2	grey	jumper	- <sup>†</sup>
3	blue	reflector	- <sup>†</sup>
4	red	anode	anode
5	brown	cathode	cathode
6	white	cathode	cathode
7	pink	jumper	- <sup>†</sup>

\* LP (longest pin) = protective earth conductor (for facilitating installation)

† Function not available for IG40 BA but must be connected.

## Operation



**WARNING:**

Do not use the IG 40 BA/EX for safety critical applications. The IG 40 BA/EX is not intended to be fail safe.



**WARNING:**

Do not use the IG 40 BA/EX to measure the pressure of explosive or flammable gases or mixtures.

## Calibration

Each IG40 BA/EX gauge head has been individually calibrated in the course of final factory testing. This ensures a high accuracy of the pressure readout.

The appropriate sensitivity coefficient factor can be found on the calibration sticker located on the reverse side of the cover of this manual.



**Note:**

*Emission current " $i_e$ " and calibration factor "CAL" can be found on the calibration sticker located on the reverse side of the cover of this manual.*

## Operation



**CAUTION:**

Humidity at the insulators (Figure 2 item 14) caused by condensing water for example, can give rise to incorrect measurements due to leakage currents.



**Note:**

*In the presence of halogen gases like fluorine, chlorine, bromine and iodine and their compounds, the yttrium oxide coating will suffer rapid wear. As a result of this, the cathodes will burn out.*



# Maintenance



## **WARNING:**

**Contaminated parts can be detrimental to health and environment.**

**Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.**



## **CAUTION:**

**Dirt and damage can impair the function of the vacuum component.**

**When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damage.**



## **CAUTION:**

**Touching the product with bare hands increases the desorption rate.**

**Always wear clean, lint-free gloves and use clean tools when working in this area.**

## Exchanging the Cathode



### **Note:**

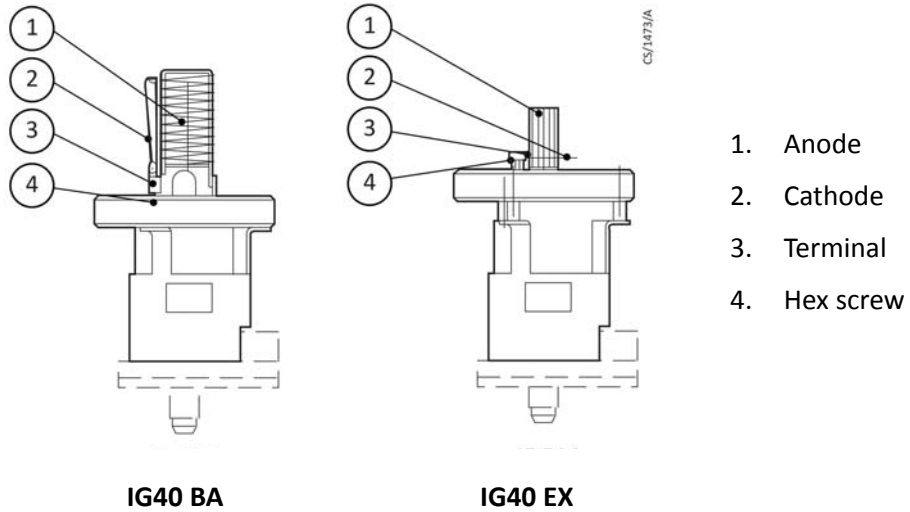
*The cathode is supplied on a plate under a cover. The cathode must only be exchanged in a room which is free of dust. Wearing of clean gloves is mandatory.*

## Preparation

1. Switch off the operating unit.
2. Detach the gauge head cable from the gauge head.
3. Remove the gauge head from the vacuum system.
4. After loosening the hex screws at both terminals remove the faulty cathode.
5. Open the transport packaging, remove the replacement cathode in the same way and install it in the place of the old cathode.

The required 0.89 mm screwdriver is included with the replacement cathode.

Figure 4 View onto the gauge head



The cathode should be positioned as parallel as possible with respect to the anode. The initially applicable calibration values do not apply any longer after exchanging the cathode. Deviations up to 15% may occur.

# Spares and accessories

## Spares

When ordering spare parts, always indicate:

- All information on the product nameplate.
- Product description and item number according to the spare parts list.

**Table 6 Spare parts**

Product description	Item number
Spare cathode IG40 BA	D03000309
Spare cathode IG40 EX	D03000319

## Accessories

**Table 7 Gauge head cables**

Product description	Item number
IG40 BA/EX cable 5 m bakeable	D03000301
IG40 BA/EX cable 10 m bakeable	D03000302
IG40 BA/EX cable 50 m bakeable	D03000305

# Storage



**CAUTION:**

**Inappropriate storage leads to an increase of the desorption rate and/or may result in mechanical damage of the product.**

**Cover the vacuum ports of the product with protective lids or grease free aluminum foil. Do not exceed the admissible storage temperature range.**

## Returning the product



**WARNING:**

**Products returned to Edwards for service or repair should, if possible, be free of harmful substances (for example, radioactive, toxic, caustic or microbiological). Otherwise, the type of contamination must be declared.**

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

# Disposal



## **WARNING:**

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Follow the relevant regulations and take the necessary precautions when handling contaminated parts.



## **WARNING:**

Products or parts thereof (mechanical and electric components, operating fluids, etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

## Separating the components

After disassembling the product, separate its components according to the following criteria:

### Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard, etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

### Other components

Such components must be separated according to their materials and recycled.

### Other Disposal Information

The IG40 BA/EX and associated cables are within the scope of the European Directive on Waste and Electronic Equipment, 2012/19/EU. Edwards offers customers a recycling service for the product/cables/associated gauge heads at the end of the product's life. Contact Edwards for advice on how to return the IG40 BA/EX and/or cables for recycling.

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## Return of Edwards Equipment - Procedure

### INTRODUCTION

Before returning your equipment, you must warn Edwards if substances you used (and produced) in the equipment can be hazardous. This information is fundamental to the safety of our Service Centre employees and will determine the procedures employed to service your equipment.

**Complete the Declaration (HS2) and send it to Edwards before you dispatch the equipment.** It is important to note that this declaration is for Edwards internal use only, and has no relationship to local, national or international transportation safety or environmental requirements. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable laws.

### GUIDELINES

- Equipment is '**uncontaminated**' if it has not been used, or if it has only been used with substances that are not hazardous. Your equipment is '**contaminated**' if it has been used with any substances classified as hazardous under the UN Globally Harmonised System on the classification and labelling of chemicals (GHS), EU Regulation No 1272/2008 on classification, labelling and packaging (CLP) or US Occupational Safety and Health regulations (29CFR1910.1200, Hazard Communication).
- If your equipment has been used with radioactive substances, biological or infectious agents, mercury, polychlorinated biphenyls (PCB's), dioxins or sodium azide, you must decontaminate it before you return it to Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to Edwards with the Declaration (HS2). Phone Edwards for advice.
- If your equipment is contaminated, you must either:
  - Remove all traces of contamination (to the satisfaction of laws governing the transportation of dangerous/hazardous substances).
  - Or, properly classify the hazard, mark, manifest and ship the equipment in accordance with applicable laws governing the shipment of hazardous materials.

**Note: Some contaminated equipment may not be suitable for airfreight.**

### PROCEDURE

1. Contact Edwards and obtain a Return Authorisation Number\* for your equipment.
2. Complete the Return of Edwards Equipment - Declaration (HS2).
3. If the equipment is contaminated, you must contact your transporter to ensure that you properly classify the hazard, mark, manifest and ship the equipment, in accordance with applicable laws governing the shipment of contaminated/hazardous materials. As the person offering the equipment for shipment, it is your responsibility to ensure compliance with applicable law. **Note: Equipment contaminated with some hazardous materials, such as semiconductor by-products, may not be suitable for airfreight - contact your transporter for advice.**
4. Remove all traces of hazardous gases: pass an inert gas through the equipment and any accessories that will be returned to Edwards. Where possible, drain all fluids and lubricants from the equipment and its accessories.
5. Seal up all of the equipment's inlets and outlets (including those where accessories were attached) with blanking flanges or, for uncontaminated product, with heavy gauge tape.
6. Seal equipment in a thick polythene/polyethylene bag or sheet.
7. If the equipment is large, strap the equipment and its accessories to a wooden pallet. If the equipment is too small to be strapped to a pallet, pack it in a suitable strong box.
8. E-mail via scan, fax or post a copy of the original with signature of the Declaration (HS2) to Edwards. The Declaration must arrive before the equipment.
9. Give a copy of the Declaration (HS2) to the transporter. You must tell your transporter if the equipment is contaminated.
10. Seal the original Declaration in a suitable envelope: attach the envelope securely to the outside of the equipment package, in a clear weatherproof bag.

**WRITE YOUR RETURN AUTHORISATION NUMBER\* CLEARLY ON THE OUTSIDE OF THE ENVELOPE OR ON THE OUTSIDE OF THE EQUIPMENT PACKAGE.**

\* not applicable in Japan

# Return of Edwards Equipment - Declaration

Return Authorisation Number: \_\_\_\_\_

You must:

- Know about all of the substances which have been used and produced in the equipment before you complete this Declaration
- Read the Return of Edwards Equipment - Procedure (HS1) before you complete this Declaration
- Contact Edwards to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to Edwards before you return your equipment as per the procedure in HS1

## SECTION 1: EQUIPMENT

Manufacturer's Product Name \_\_\_\_\_  
 Manufacturer's Part Number \_\_\_\_\_  
 Manufacturer's Serial Number \_\_\_\_\_

Has the equipment been used, tested or operated?  
 YES, Used or operated  Go to Section 2  
 YES, Tested, but not connected to any process or production equipment, and only exposed to Nitrogen, Helium or Air  Go to Section 4  
 NO  Go to Section 4

**IF APPLICABLE:**

Tool Identification Number \_\_\_\_\_  
 Tool Manufacturer/OEM \_\_\_\_\_  
 Tool Model \_\_\_\_\_  
 Process \_\_\_\_\_  
 Installed Date \_\_\_\_\_ De-installed Date \_\_\_\_\_  
 Part Number of Replacement Equipment \_\_\_\_\_  
 Serial Number of Replacement Equipment \_\_\_\_\_  
 Pump datalog attached? YES  NO   
 (Edwards Internal Use Only)

## SECTION 2: SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Are any substances used or produced in the equipment:

- Radioactive, biological or infectious agents, mercury, poly chlorinated biphenyls (PCBs), dioxins or sodium azide? (if YES, see Note 1) YES  NO
- Hazardous to human health and safety? YES  NO

**Note 1:** Edwards will not accept delivery of any equipment that is contaminated with radioactive substances, biological/infectious agents, mercury, PCB's, dioxins or sodium azide, unless you:

- Decontaminate the equipment
- Provide proof of decontamination

**YOU MUST CONTACT EDWARDS FOR ADVICE BEFORE YOU RETURN SUCH EQUIPMENT**

## SECTION 3: LIST OF SUBSTANCES IN CONTACT WITH THE EQUIPMENT

Substance name	Chemical Symbol	Precautions required (for example, use protective gloves, etc.)	Action required after a spill, leak or exposure

## SECTION 4: RETURN INFORMATION

Reason for return and symptoms of malfunction: \_\_\_\_\_

For how many hours has the product run? \_\_\_\_\_ Do you wish to purchase a full Failure Analysis report? YES  NO

If you have a warranty claim:

- who did you buy the equipment from? \_\_\_\_\_
- give the supplier's invoice number \_\_\_\_\_

## SECTION 5: DECLARATION

Print your name: \_\_\_\_\_ Print your job title: \_\_\_\_\_

Print your organisation: \_\_\_\_\_

Print your address: \_\_\_\_\_

Telephone number: \_\_\_\_\_ Date of equipment delivery: \_\_\_\_\_

I have made reasonable enquiry and I have supplied accurate information in this Declaration. I have not withheld any information, and I have followed the Return of Edwards Equipment - Procedure (HS1).

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

**Note: Please print out this form, sign it and return the signed form as hard copy.**

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