D357-25-880
Issue D

Instruction Manual

Active Strain Gauge

Description	*Item Number*
ASG-1000-1/8 NPT	D357-25-000
ASG-1000-NW16	D357-26-000
ASG-2000-1/8 NPT	D357-27-000
ASG-2000-NW16	D357-28-000

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Declaration of Conformity

We, BOC Edwards,
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declare under our sole responsibility that the product(s)

Active Strain Gauge

ASG-1000-1/8 NPT	D357-25-000
ASG-1000-NW16	D357-26-000
ASG-2000-1/8 NPT	D357-27-000
ASG-2000-NW16	D357-28-000

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.
EN61326:1997 + A1:1998 + A2:2001 (Class B Emissions)	Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements.

following the provisions of

89 / 336 / EEC	Electromagnetic Compatibility Directive.

J D Watson

Dr. J.D. Watson, Director of Technology, VEMD

25 MAY 2004 EASTBOURNE

Date and Place

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

BOC EDWARDS

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GEA/0113

Illustrations

1 INTRODUCTION

1.1 Scope of this manual

This manual provides installation, operation and maintenance instructions for the Edwards ASG (Active Strain Gauge). You must use the ASG as specified in this manual.

Read this manual before you install and operate the ASG. Important safety information is highlighted as WARNING and CAUTION instructions; 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 or process.

The unit used through this manual conforms to the SI international system of units of measurement.

The following symbols appear on the ASG:

Warning - refer to accompanying documentation.

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

1.2 Description

The ASG, shown in figure 1, is a strain gauge and gauge controller in a single compact unit. The measurement range of the ASG-1000 is 1000 to 1 mbar. The range of the ASG-2000 is 2000 to 1 mbar.

The ASG requires a 13.5 to 36 V d.c. power supply: it has a 0 to 10 V d.c. linear analogue output which is related to pressure. The ASG is compatible with all of the Edwards AGCs (Active Gauge Controllers) and with the ADD (Active Digital Display). Alternatively, you can use an independent power supply for the ASG and can read the ASG output signal with a voltmeter or an analogue-to-digital converter. A standard Active gauge cable plus an ASG adapter cable are used to connect the ASG to an AGC or ADD. These are available as accessories (refer to section 6.2). To connect to an electrical supply and voltmeter, the 4-way connector on the gauge head can be used.

A gauge identification signal is incorporated in the adapter cable: this is used by Edwards AGCs to identify which type of active gauge is connected.

1.3 Gas dependency

The pressure sensing technique depends on the deflection of a stainless steel diaphragm. The measurement is therefore completely independent of gas type.

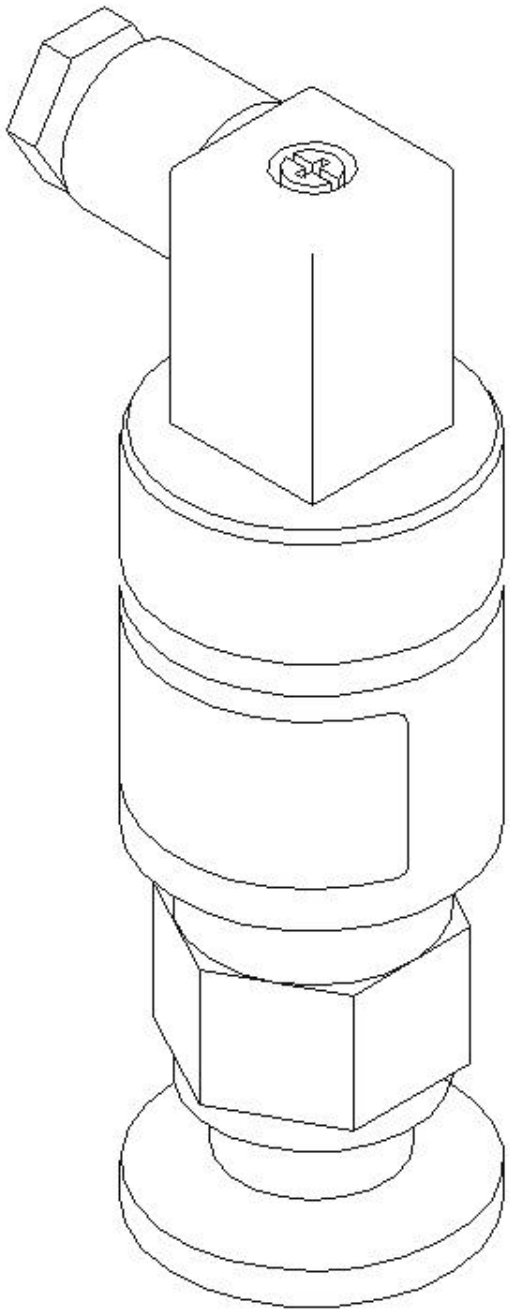


Figure 1 - General View of NW16 Version Active Strain Gauge

2 TECHNICAL DATA

2.1 Mechanical data

Dimensions	See figure 2
Mass	150 g
Volume of gauge tube	
NW16	1.85 cm^3
1/8" NPT	1.25 cm^3
Enclosing rating	IP65

2.2 Performance, operation and storage conditions

Ambient temperature	
operation	-20 to 125^oC
storage	-40 to 125^oC
Compensated pressure	10 to 50^oC
Ambient humidity (operating) (non-condensing)	10 to 90%
Pressure containment	180 mbar
Maximum over pressure negligible	2 x full scale with calibration change
Pressure range	
ASG-1000	1000 to 1mbar
ASG-2000	2000 to 1 mbar
Accuracy	± 0.2% full scale
Stability	0.2% full scale
Temperature co-efficient	0.05% full scale per ^oC

2.3 Electrical data

Note: The relationship between the output signal voltage and the pressure is linear with 10V corresponding to the full scale of the gauge (e.g. for 1000 mbar full scale gauge 10 V is equivalent to 1000 mbar, 1 V is equivalent to 100 mbar, 0.1 V is equivalent to 10 mbar etc).

Electrical supply	
Voltage	+13.5 to 36 V d.c.
Max source resistance	100 Ω
Maximum power	0.4 W
Electrical connector	4 Pin Micro Din
Pressure output signal	
Nominal range	0 ≤ output ≤ 10 V d.c.
Extreme range	output < -0.5 V d.c. or output > 30 V d.c.
Impedance	200 Ω
Min load	50 KΩ

2.4 Material exposed to vacuum

Stainless Steel 316L.

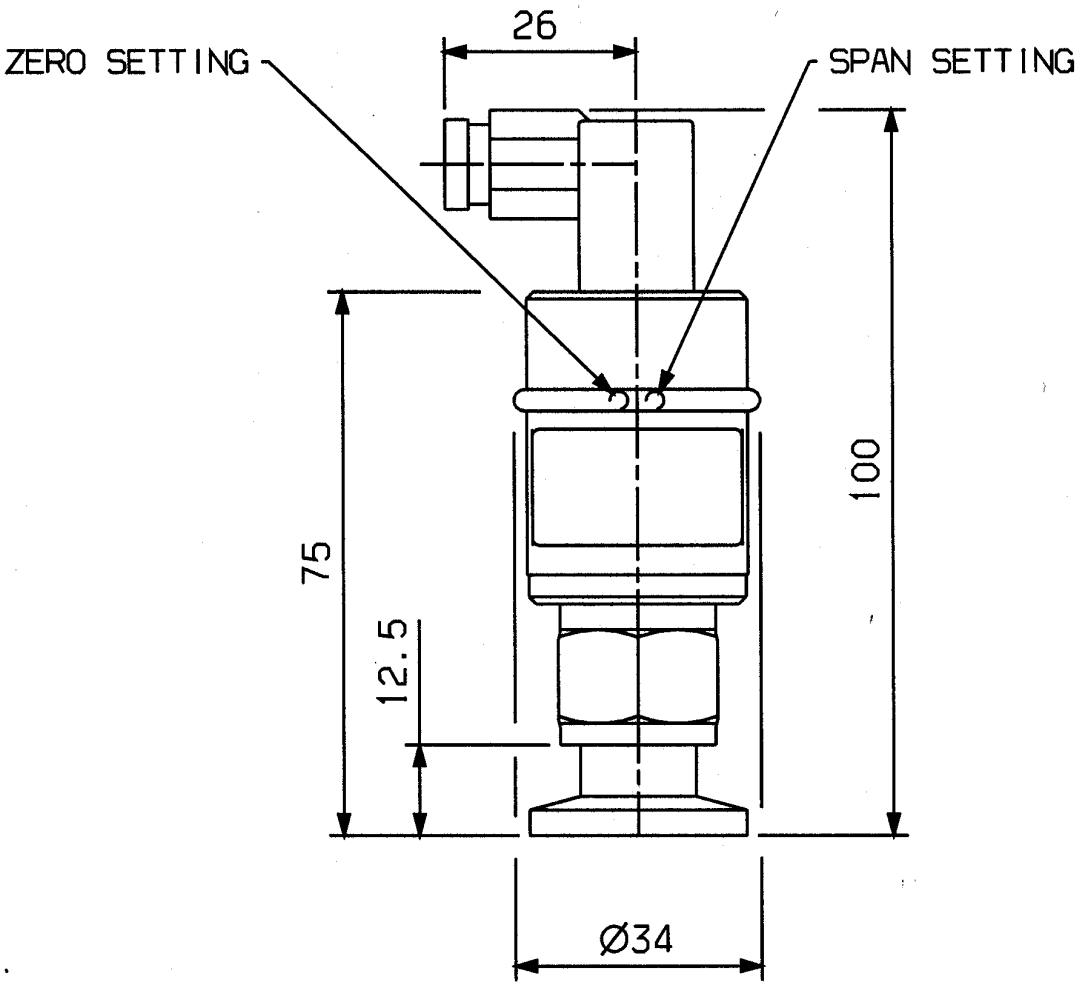


Figure 2 - Dimensions of Active Strain Gauge

3 INSTALLATION

3.1 Unpack and inspect

Remove all packing material and protective covers and check the ASG.

If the ASG is damaged, notify your supplier and the carrier in writing within three days; state the Item Number of the ASG together with your order number and your supplier's invoice number. Retain all packing materials for inspection. Do not use the ASG if it is damaged.

If the ASG is not to be used immediately, replace the protective covers. Store the ASG in suitable conditions as described in section 5.

3.2 Fit the ASG to the vacuum system

The ASG can be mounted in any orientation. To avoid the build-up of debris or condensable material in the body tube of the ASG we recommend that you install the ASG vertically as shown in Figure 2.

To connect the ASG to your vacuum system:

- Use an 'O' ring/centring ring or Co-seal and clamp to connect an NW16 flange to a similar flange on the vacuum system.
- Use a stepped 'O' ring carrier or Co-seal to connect an ASG with a NW16 flange to a NW10 flange.
- Use PTFE tape for 1/8" NPT connection.

3.3 Electrical connections

WARNING
If the ASG malfunctions, the ASG pressure output may be incorrect. If such a failure could cause injury to persons or damage equipment, you must install a suitable control system to indicate the failure and, if necessary, to close down your process system.

When using a cable longer than 30 m, full compliance with the EN61326 requires an in-line surge suppressor (please refer to Section 7.2).

3.3.1 Connect to BOC Edwards Controller

Connect the ASG to the controller using an adapter cable and an active gauge cable (refer to Section 7).

3.3.2 Connect to your own supply and control equipment

Note: Do not connect the electrical supply common to the signal common. If you do, the ASG output signal will be inaccurate.

If connection is to be made using the 4 pin DIN connector, the pin allocations are as shown in Figure 3.

Pin Number	Use
1	Electrical supply positive voltage
2	Electrical supply common
3	Pressure measurement output signal
4	Output common

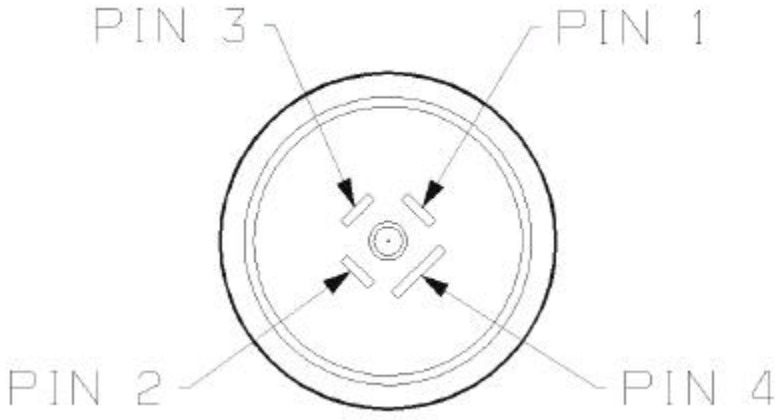


Figure 3 - Pins on the ASG electrical connector socket

If connection using an FCC68 connector is preferred, the ASG adapter cable may be used and the pin allocations are as shown in Figure 4.

Pin Number	Use
1	Electrical supply positive voltage
2	Electrical supply common
3	Pressure measurement output signal
4	Gauge identification signal
5	Signal common
6	No connection
7	No connection
8	No connection

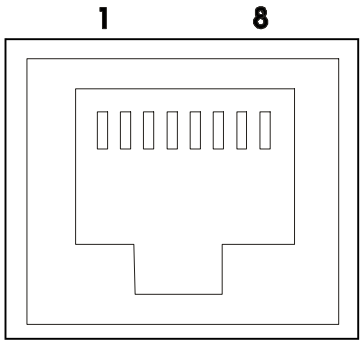
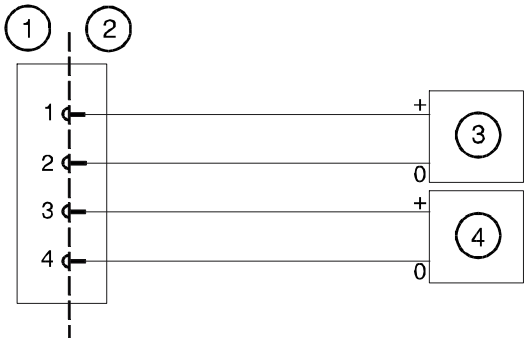


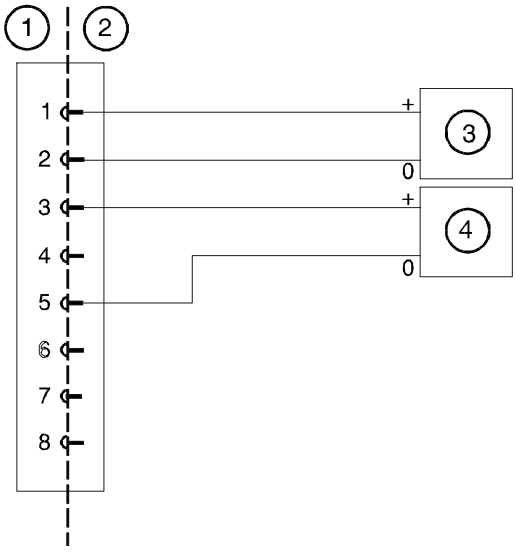
Figure 4 - Pins on the ASG adapter cable socket

Schematic diagrams of the recommended electrical connections to the ASG are shown in Figure 5 and Figure 6.



1. ASG electrical connector socket
2. Cable electrical connector plug
3. Electrical supply
4. Voltmeter

Figure 5 - Schematic diagram of typical electrical connections using 4 pin DIN connector



1. Adapter cable electrical connector socket
2. Cable electrical connector plug
3. Electrical supply
4. Voltmeter

Figure 6 - Schematic diagram of typical electrical connections using FCC68 connector

4 OPERATION

4.1 Pressure measurement

For most accurate pressure measurement the procedure in Section 5.1 should be used to zero the gauge.

If you connect the ASG to an Edwards ADD or AGC display/controller, the pressure measured by the ASG is shown on the display.

If you connect the signal output of the ASG to a voltmeter, convert the measured voltage to the corresponding pressure value using the following formula:

$$\text{Pressure} = \frac{\text{Full scale}}{10} \times \text{Voltage}$$

5 MAINTENANCE

5.1 Zero adjustment

All diaphragm type gauges can exhibit a small drift in zero as a result of frequent cycling, over pressuring or contamination. This can be corrected by carrying out a zero adjustment.

To zero the ASG, first evacuate the system to a pressure whose value is insignificant when compared to the required measuring accuracy. Table 1 suggests the pressures that should be achieved for zeroing to give maximum accuracy.

Once the zeroing pressure has been achieved the ASG pressure display should be adjusted to zero. This can be done using the zero setting potentiometer located on the side of the gauge head under the external 'O' ring (see Figure 2). The second potentiometer is for setting the gauge span and should not be adjusted without appropriate calibration equipment. If the ASG is used with a BOC Edwards Controller then the zero adjustment can be made at the display rather than at the gauge head if this is more convenient (refer to the Controller's instructions for details).

Transducer Full Range (mbar)	Zeroing Pressure (mbar)
2000	< 0.02
1000	< 0.01

Table 1 - Zeroing Pressure

5.2 Cleaning

If the gas being measured contains oil vapour or other condensable products, the diaphragm may periodically become contaminated which may cause shifts in both zero and span. Any clean solvent that is compatible with stainless steel 316L may be used to dissolve the condensate and flush out the pressure inlet port.

Note: Do not use any ultrasonic procedure in cleaning the gauge since that may damage the unit.

6 STORAGE AND DISPOSAL

6.1 Storage

Return the ASG to its protective packaging and store the ASG in clean dry conditions until required for use. Do not exceed the storage temperature conditions specified in Section 2.

When require for use, prepare and install the ASG as described in Section 3.

6.2 Disposal

Dispose of the ASG and any components safely in accordance with all local and national safety and environmental requirements.

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

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

Particular care must be taken if the ASG has been contaminated with dangerous process substances.

7 SPARES AND ACCESSORIES

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Great Britain, Hong Kong, Italy, Japan, Korea, Switzerland, 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 you order, 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

The adapter cable for use with the Edwards Active Gauge Controllers or Active Digital Displays is:

ASG adapter cable	0.5 m	D400-03-060

There are different lengths of cable to connect from the Edwards ASG to the adapter cable. They are as follows:

Cable length		**Item Number**
0.5m	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
25 m	80 feet	D400-01-250
50 m	150 feet	D400-01-500
100m	325 feet	D400-01-999

Surge suppressor	D400-06-000

BOC EDWARDS

Form HS1

Return of BOC Edwards Equipment - Procedure

INTRODUCTION

Before returning your equipment, you must warn BOC 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 BOC Edwards before you dispatch the equipment. It is important to note that this declaration is for BOC 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 EU Directive 67/548/EEC (as amended) or OSHA Occupational Safety (29 CFR 1910).
- 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 BOC Edwards. You must send independent proof of decontamination (for example a certificate of analysis) to BOC Edwards with the Declaration (HS2). Phone BOC 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 BOC Edwards and obtain a Return Authorisation Number for your equipment.
2. Complete the Return of BOC 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 BOC 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. Fax or post a copy of the Declaration (HS2) to BOC 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.

BOC EDWARDS

Form HS2

Return of BOC 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 BOC Edwards Equipment - Procedure (HS1) before you complete this Declaration
- Contact BOC Edwards to obtain a Return Authorisation Number and to obtain advice if you have any questions
- Send this form to BOC Edwards before you return your equipment

SECTION 1: EQUIPMENT

Equipment/System Name_____

Part Number _____

Serial Number_____

Has the equipment been used, tested or operated ?

YES ❑ Go to Section 2 NO ❑ Go to Section 4

IF APPLICABLE:

Tool Reference Number_____

Process _____

Failure Date_____

Serial Number of Replacement Equipment_____

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 : BOC 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 BOC 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 _____

_____

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 BOC Edwards Equipment - Procedure (HS1).

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

Signed: _____Date_____

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