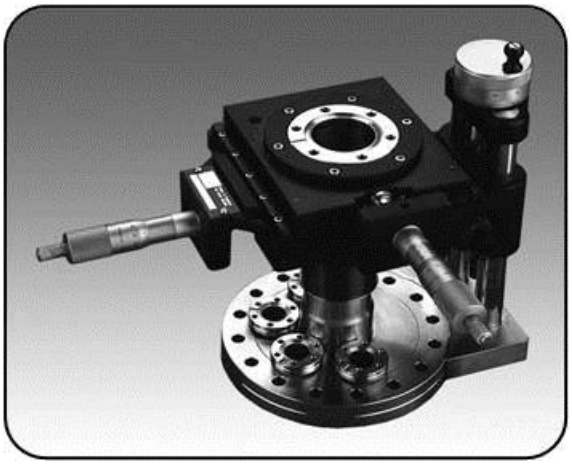
# Operating and Maintenance Handbook

# MINIAX (XYZ) HIGH PRECISION TRANSLATOR



| REVISION | DATE | COMMENTS | INITIALS |
|---|---|---|---|
| 1 | April 2004 | Original release | MJD |
| 2 | Aug 2015 | VACGEN branding | AJL |
| | | | |
| | | | |





**sales@vacgen.com** **www.vacgen.com** **+44 (0) 1424 856 333**

**WARRANTY**

1. Subject to fair wear and tear and the due, observance of any installation user, storage, operating or maintenance instructions the Seller undertakes to replace or, at its option repair free of charge to the purchaser, any goods which the purchaser can establish are defective by reason of defective workmanship or materials which are returned to the Seller, carriage paid, within 12 months of the date of dispatch by the Seller. In the event, however, that the Seller supplies spare parts either direct, or that are fitted or installed or replaced by the Sellers' service center such spare parts will be subject to a warranty period of six months only.
2. The Purchaser cannot return any product for warranty repair without the prior approval of VACGEN and the issue of a Goods Return Number (GRN). This shall be obtained by contacting the service center at VACGEN. All returned products must be accompanied by a completed Declaration of Contamination form. Customers must, in the first instance, contact the local selling agent.
3. We reserve the right to decline to service equipment, we consider is in any way hazardous until a clearance or safety certificate, in a form satisfactory to VACGEN, has been completed and returned by the customer.

**REPAIR**

The following additional terms and conditions apply in the event that the customer elects to use the services of VACGEN workshop on a chargeable basis.

1. At its own cost the customer shall dispatch the equipment to the workshop, carriage paid, suitably packaged, protected and insured, bearing, a Goods Return Number (GRN)and a completed Declaration of Contamination certificate obtained from VACGEN in advance of shipment.
2. During the period that the equipment is on VACGEN premises, VACGEN will insure the equipment against all risks.
3. Vacuum Generator will provide an acknowledgement of the receipt together with an estimate of the repair charges. Such estimates are carried out on a visual basis and are therefore intended as a guide only. Formal fixed price repair quotations are available and involve the disassembly of the equipment to determine the full extent of
the work necessary to restore the equipment to an acceptable standard. In the event that the customer chooses not to proceed with the repair VACGEN will make a charge to cover this examination effort.

Note:
The above are extracts from VACGEN Conditions of sale. Complete copies can be obtained from: VACGEN, Maunsell Road, Castleham Industrial Estate St. Leonards on Sea, East Sussex, TN38 9NN, United Kingdom.



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**Warning - Read this before Unpacking**

Read the following unpacking instructions before unpacking is commenced. Do not operate any of the controls until the X-Y transit pin and all transit items are removed. Failure to comply with the installation instructions could result in serious damage to both the translator and the vacuum chamber.

**Unpacking Instructions**

1) Lift out the translator taking care not to hit or damage any protruding parts. Keep all packing.

2) Remove the transit pin (see figure 1) and remove all transit items before operating any of the controls.

3) Carefully inspect the manipulator for visual signs of damage. All parts should be secure and there should be no 'play' in any of the movements.

4) The packaging is designed to withstand shock and vibration but some of the fixing screws may become loose, more especially with air freight shipment. All screws should be securely fastened but not excessively tight.

5) Any damage in transit should be reported to the carrier and to VACGEN at Hastings, or your local agent, within three days.



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## 1.0 Introduction

The XYZ is a precision, high rigidity, UHV specimen translator having X and Y motions together with a range of Z travels. There is a choice of translator mounting flange. The standard mounting flange is 150mm OD with 4 mini feedthrough ports. A 70mm OD mounting flange version is also available; this translator has no feedthrough ports.

The 70mm OD accessory flange can accommodate a range of attachments such as rotary drives and specimen attachments; heating and cooling accessories can be fitted to the feedthrough ports on the 150mm mounting flange version (see section 11.0).

The XYZ translator is shown in figure 1. The translator has been designed for ease and convenience of use. These instructions should be read in conjunction with the user instructions for any other accessories attached to the XYZ.

There are Z travels of 50 and 100mm available with a system flange of 150 or 70mm OD. X-Y movement is +/- 12.7 mm, depending on the accessories that are fitted.

Note:
Ensure that the XY stage transit pin is removed before attempting to operate the XY stage. Failure to do this could cause severe damage to the XY stage.

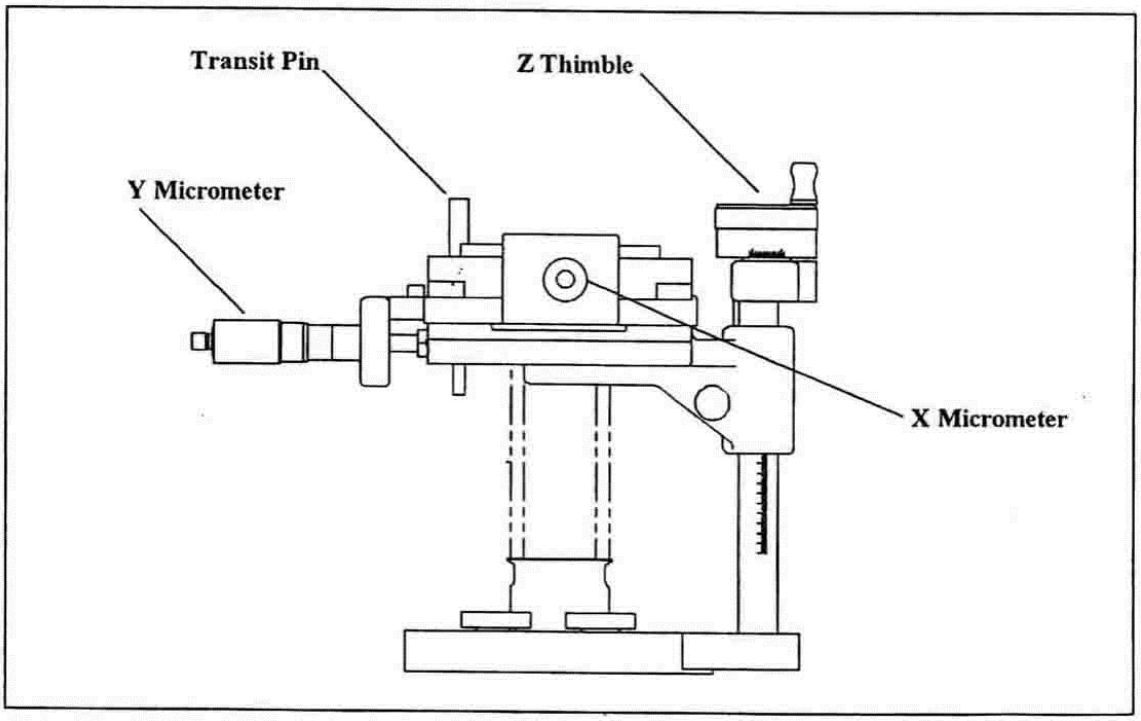


**Figure 1 - Main features of the XYZ translator**

## 2.0 Specifications

| Motion | Extent | Resolution | Repeatability |
|---|---|---|---|
| X Translation | +/- 12.7mm | 0.01mm | 0.005mm |
| Y Translation | +/- 12.7mm | 0.01mm | 0.005mm |
| Z Translation | 50 and 100mm | 0.005mm | 0.01mm |

| | |
|---|---|
| X and Y Vectorial Sum | + 12.7 mm with rotary drive shaft of 9.5mm or less (section 5) |
| Construction | Welded Stainless Steel and Light Alloy |
| System Flange | 70mm OD or 150mm OD |
| Accessory Ports | 4X 34mm OD on 84mm PCD (150mm flanged version only) |
| Bellows ID | 35mm |
| Pressure Range | 1 bar to below $10^{-11}$mbar |
| Bakeout Temperature | 200$^{o}$C |
| Operating Temperature | -20$^{o}$C to 100$^{o}$C |
| Accessory Flange | 70mm OD with Tapped Holes |

## 3.0 Installation Guidelines

The translator will operate when mounted in any orientation, vertical, horizontal or inverted. Consideration must be given to the loading imposed on the support vessel by the translator especially in the horizontal case. When installing, take care when lifting, to avoid damage to protruding components. Also retain the transit pin until the time of installation.

All necessary metric screws for the accessory and feedthrough flanges are included, together with the appropriate metric Allen keys.

## 4.0 Construction

The vacuum envelope is constructed from stainless steel and all joints are welded. The superstructure, comprising the X, Y and Z slides, is of rigid design and is constructed principally from aluminum alloy castings. The guidance system utilizes bushes running on shafts for the Z axis, and adjustable roller bearing Vee slides for the X and Y axes. The guide shafts and slides are machined to extremely close tolerances to ensure a precise relationship between the three planes in all positions. The translatory motion of the slides is achieved by the use of precision micrometers which are attached to the X and Y slides by a coupling which ensures accurate positioning with low backlash.

The translator can be operated in any orientation. The Z slide is provided width a linear scale. All moving parts are lubricated with high temperature lubricants, specially selected to ensure smooth and easy operation with a minimum of wear.

All parts of the translator and its accessories are interchangeable, thus enabling accessories to be added (or parts replaced) as and when required.

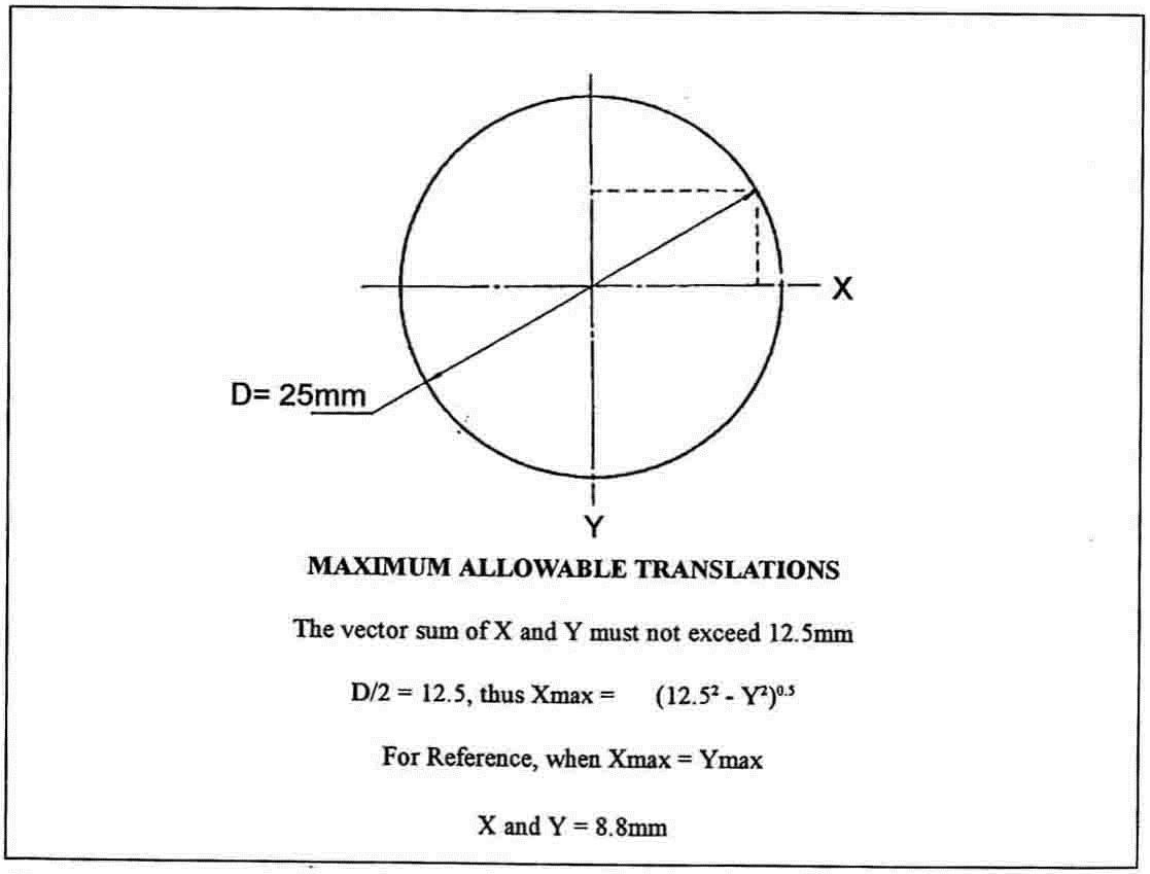


**Figure 2 - Maximum allowable X-Y translations: the X-Y vectorial sum**

## 5.0 Operation

The translator is a precision mechanism and care in its use should be exercised at all times, especially at the extremes of travel when contact with a fixed stop or object in the vacuum system or elsewhere, could impose a strain on the mechanism. Attention is drawn to the travel limits of the X and Y translations which are indicated by the vectorial drawn of the X and Y motions (see figure 2). As no stops can be provided, care must be taken not to exceed the vectorial sum of 12.5 mm with a shaft of 9.52 mm diameter centred on the accessory flange.

## 6.0 Accessory Flanges

When attaching accessories such as the RD 1 or the RD2 rotary drive, or any other fitment to the accessory flange, care should be taken when fitting, tightening or removing the six flange bolts to prevent any of the tightening torque being transmitted to the bellows.
The four 34mm OD mini flanges (tapped M4 and supplied with the necessary screws and Allen key) are provided for introduction of electrical or other services, such as liquid nitrogen, water etc. The flanges are spaced on an 84 mm PCD.

## 7.0 Bakeout

The translator may be baked without any dismantling to 200$^{o}$C maximum. It is recommended that the three translations be positioned approximately at mid position. After bakeout, the tightness of the pillar retaining grub screws in the tie bar and the accessory port clamping arrangement should be checked (see figure 3).

Warning: VACGEN cannot accept responsibility for any damage to equipment or injury to personnel arising from failure to observe the requirement as set out in notes 1 and 2 below.

1) The heating must be by convection. Heating tape must not be used as this can cause damaging hot spots.

2) The sensing element of the VACGENcouple controlling the heaters must be suspended in air near to the translator and approximately 50 mm below the uppermost portion of the translator. Under NO circumstances should the sensing element be attached directly to, i.e. be in thermal contact with the translator or any other part of the vacuum system.

**8.0 Maintenance**

This translator has been designed to operate for long periods without attention. It may however, be found necessary to renew the lubricants periodically. As a guide it is suggested that renewal of lubricants would be advisable after the translator has experienced accumulated bakeouts, or when any of the motions appear to require more effort to operate than previously.

**8.1 Factory Servicing**
A factory servicing scheme exists for all translators. The translator should be returned to the VACGEN factory with a covering order. The servicing scheme includes the following:

- Complete strip down
- Cleaning and/or refurbishing of worn items
- Re-lubrication
- Re-assembly



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### 8.2 Renewal of Lubricants

Should it become necessary to renew the lubrication of the micrometers, it is recommended that the XYZ be returned to VACGEN for servicing. The X, Y and Z slides can be re-lubricated by the user, although once again, return to the factory is recommended. To re-lubricate the slides it will first be necessary to completely remove all existing lubricants using a good degreaser. All parts should then be thoroughly cleaned and re-lubricated as follows:-

| Description | Lubricant | Comments |
|---|---|---|
| Micrometers | Dow Corning Silicone Grease FS3451 | Factory service only |
| X and Y Vee slides | Dow Corning FS3451 | Factory service recommended |
| Z slide bearings | Self-lubricating | Factory service recommended |
| Z Drive screw | Carbaflo Grease | Lubricate when necessary |

All screws used externally to the vacuum should be treated with a light coat of high temperature thread lubricant before reassembly.

A kit containing the necessary lubricants is available (order code ZHPTSLK) and comprises:

Silicone Fluid 710R or 710
Silicone Grease FS3451
Carbaflo Grease
VG Thread Lubricant

### 9.0 X-Y Micrometer Stage

A transit pin is provided to secure the stage in the central position to provide support to the micrometers during transit. The transit pin accurately positions the X and the Y slides in the zero central position; at this position the micrometers should both read 12.5mm. After installation remove the pin and retain safely.

Note:
Do not attempt to drive the X or Y motions with the pin in place.



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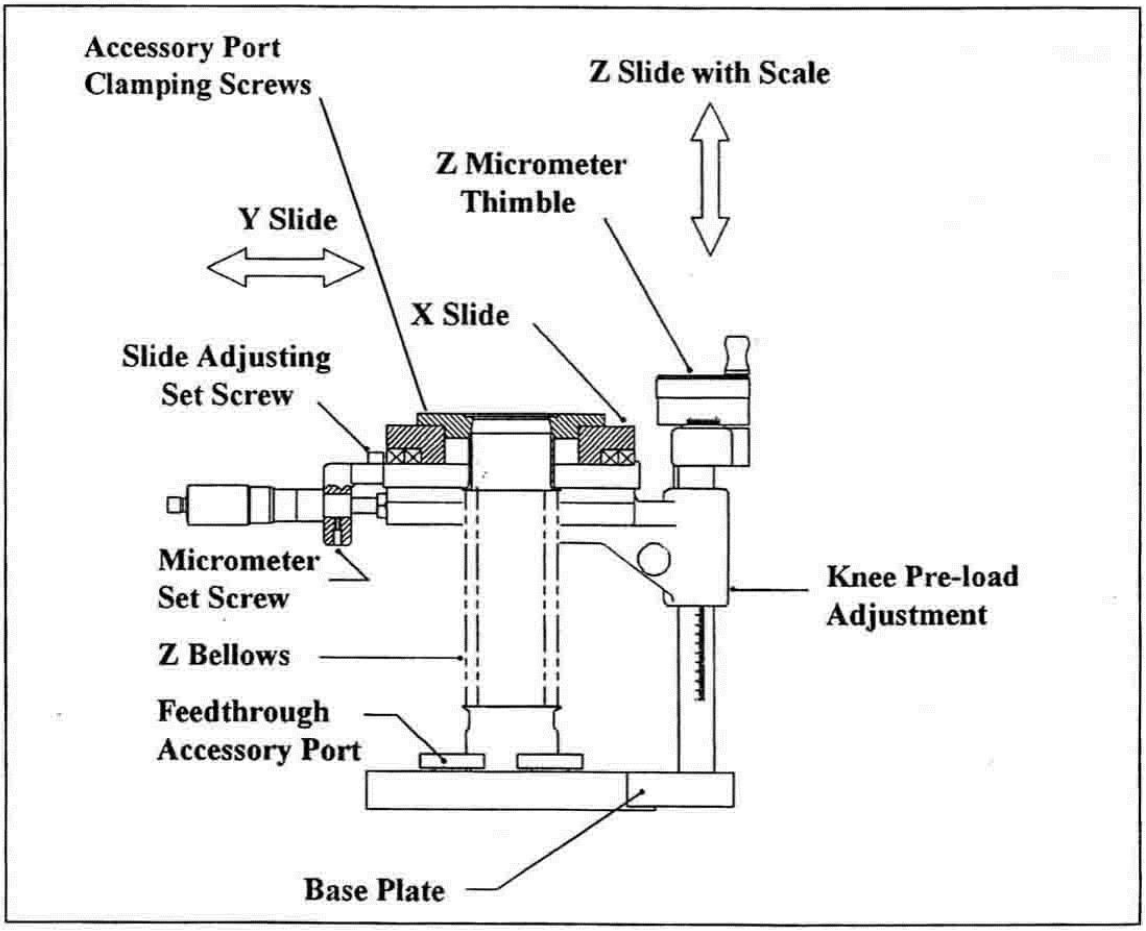


**Figure 3 - Cross-section through the LCM translator**

### 9.1 X-Y Slide Adjustments

Adjustments of the X-Y slide should not normally be necessary (if it appears that adjustment is necessary we recommend that this is carried out by VACGEN). Periodically check that none of the screw fixings have slackened off, due perhaps to the effects of prolonged baking or use. All screws should be secure - that is not slack nor excessively tight, with the exception of the linear bearing adjusting set screws which should not normally be touched.

Adjustment of these slides is best done when the translator is not 'under vacuum'. To adjust either slide (refer to figure 3), first slacken the five M3 socket head screws (using a 2mm A/F Alien key) just sufficiently to enable the three socket set screws to position the Yee slide as required. Do not over-tighten the socket set screws. Re-tighten the five socket head screws securely on completion of the adjustment.

Note:
The Vee slides must not be excessively preloaded by means of the three socket set screws.

## 10.0 The Z Drive

The knee carries a nut which is driven by a lead screw supported by a bearing in the top plate of the Z support structure (see figure 3). The lead screw is driven directly by means of a calibrated thimble. The Z assembly is supported by a pair of guidance system pillars which are secured to the base plate and to the top plate. Measurement of Z position is by a scale on the side of one of the pillars and the index dial of the thimble.

### 10.1 Z Adjustments

Adjustments to the Z slide guidance bearings are unlikely to be necessary. If adjustments are found to be necessary, proceed as follows:-

a) First remove the manipulator from the vacuum system.

b) Remove the Z drive screw shaft by releasing the Z knob set screw, removing the knob and the bearing retainer clip. Unscrew the Z screw from its nut. Support the knee during this operation. The knee is now free to move up and down. When correctly adjusted the knee should move up and down smoothly and easily with little sideways movement. The knee houses four adjustable linear bearings. Access to the pre-load adjusting screws is via the group of four holes at the rear of the knee casting, two in each side.

## 11.0 Accessories and Spares

A full range of compatible accessories is available for use with the XYZ translators including:

| Order Code | Description |
|---|---|
| ZRD1 | RD1 Rotary Drive |
| ZRD2 | RD2 Rotary Drive with secondary axial motion |
| SH Series | Specimen Manipulators for use with RD 1 and RD2 Rotary Drives |
| HST Series | Resistive Heating Attachments |
| EBH Series | Electron Bombardment Heating Attachments |
| LN Series | Liquid Nitrogen Cooling Attachments |
| CLNH Series | Combined Specimen Heating and Cooling Attachments |
| EFT Series | Electrical Feedthroughs on 34mm OD (mini) flanges |
| LFT Series | Liquid Nitrogen Feedthroughs on 34mm OD (mini) flanges |
| ZHPTSLK | Lubrication Kit |



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## Service and Repair Form

Declaration of Contamination of Equipment and Components

Serving and repairs will only be carried out if the conditions for Servicing and Repair are complied with in full, according to the VACGEN Ltd. Conditions of Sale. A summary of these requirements are included on the inside front cover of the Operating Instructions. The manufacturer will refuse to accept any equipment without a signed declaration attached to the OUTSIDE of the packaging. This declaration can only be completed and signed by authorized and qualified staff.

**1 Description of Equipment and Components**

Equipment Type……Model Number……
Serial Number…… Your Reference Number……

**2 Reasons for return**……
……
……
……
……
……

**3 Condition of Equipment**

YES ( ) NO ( ) Toxic?
YES ( ) NO ( ) Explosive?
YES ( ) NO ( ) Radioactive?
YES ( ) NO ( ) Corrosive?
YES ( ) NO ( ) Biological Hazard?
YES ( ) NO ( ) Other Harmful Substances?

Equipment and Components that have been contaminated, WILL NOT be accepted without written evidence of decontamination.

**5 Contamination Materials**

List all the substances, gases and by-products that may have come in contact with the equipment, giving trade name, manufacture, chemicals names or symbols.
Please note that any of these listed, must be completely removed, so it is safe to handle and weld, without giving off health threatening gases. Please enter details below and/or attach data sheets
……
……
……

6 Legally Binding Declaration

I hereby declare that the information supplied on this form is complete and accurate.
There by stating that the goods offer no risk to health or safety
Organisation…… Name……
Country…… Job Title……
Post/ZIP code…… Telephone……
Email……
Signature…… Date……

Return goods to: Address at top
Phone: (0) 1424 851291 Fax (0) 1424 851489 (Form VGF33)