



## User Guide

Swift PRO series of optical and video measuring systems

- ✓ Swift PRO Duo
- ✓ Swift PRO Cam
- ✓ Swift PRO Elite



FM 557119

*Vision Engineering Ltd has been certified for the quality management system ISO 9001:2015.*



## General

Intended use of equipment:

Swift PRO provides high accuracy non-contact measurement of complex manufactured components and materials.

### Safety

Before using your system for the first time, please read the Health & safety section of the user guide.

Ensure that:

- Your system and accessories are operated, maintained and repaired by authorised and trained personnel only.
- All operators have read, understood and observe the user manual, in particular the safety regulations.

### Cleaning

- Disconnect your system from the electrical source before cleaning.
- Do not use any unsuitable cleaning agents, chemicals or techniques for cleaning.
- Never use chemicals to clean coloured surfaces or accessories with rubberised parts.
- Use a specialist lens cloth to clean optical surfaces.

### Servicing

Repairs may only be carried out by Vision Engineering-trained service personnel. Only original Vision Engineering spare parts may be used.

## Symbols used

### **Warning!**

A potential risk of danger exists. Failure to comply can cause i) a hazard to personnel; ii) instrument malfunction and damage. Please consult the operating instructions provided with the product.

### **Warning of electrical shock hazard**

This symbol indicates the presence of electric shock hazards. Please consult the operating instructions provided with the product.

### **Important information**

This symbol indicates important information. Please carefully follow the instructions or guidelines.

## Health & safety

### **Unauthorised alterations to the instrument or non-compliant use shall invalidate all rights to any warranty claims.**

### Electrical safety

- Disconnect your system from the electrical source before undertaking any maintenance.
- Avoid using any form of liquid near the system.
- Do not operate your system with wet hands.

### Heat safety

- A dust cover is supplied with your system. Turn off your system and ensure it has cooled down before using the dust cover.

### Illumination safety

- Do not look directly at the illuminated LED's. This may cause damage to the eyesight.

### Environmental considerations

- Avoid large temperature fluctuations, direct sunlight and vibrations.
- Ensure electrical components are at least 10cm from walls and combustible materials.
- Position the system on a firm, rigid and level table.
- The equipment should be positioned so that access to the electrical input connector is always available.
- Avoid positioning your system where bright reflections may affect the image.

### Operator wellbeing

- The advanced ergonomic design and construction of Vision Engineering products are intended to deliver superior ergonomic performance, reducing the exertion of the user to a minimum. Depending on the duration of uninterrupted work, appropriate measures should be taken to sustain optimal operator performance. This could include: Optimal arrangement of workplace; Variation in task activity; Training of personnel on workplace ergonomics and general health and safety principles.
- It is important to set-up and optimise your working environment correctly in order to obtain maximum benefit from the advanced ergonomic design of your system. For more information visit: [www.visioneng.com/ergonomics](http://www.visioneng.com/ergonomics)

### Compliance statements

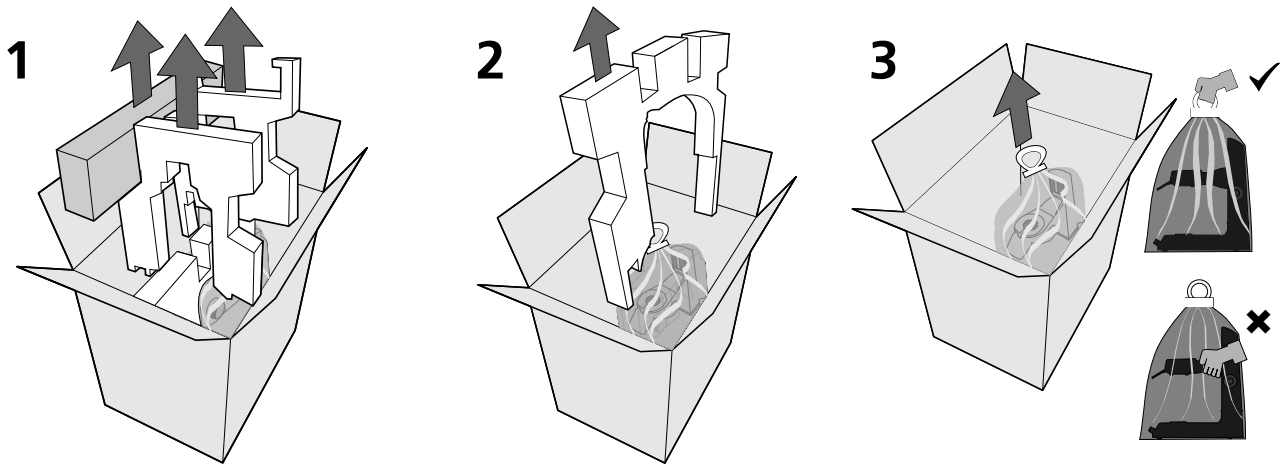
Vision Engineering and its products conforms to the requirements of the EC Directives on Waste Electrical and Electronic Equipment (WEEE) and Restriction of Hazardous Substances (RoHS).



All Vision Engineering products conform to the CE mark, demonstrating that each product meets the requirements of the applicable EC directives. Where applicable, other characteristics of the CE directive are implied such as essential health and safety requirements from all the directives that applies to its product, including low voltage directive and the EMC directive.

# UNPACKING

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We have compiled the texts and illustrations as accurately as possible. However, Vision Engineering Ltd. will not be responsible for the accuracy of the information contained in this document, which is used at your own risk and should not be relied upon. The information included in this manual may be changed without prior notice.

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## Service & calibration record

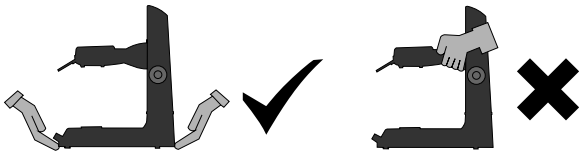
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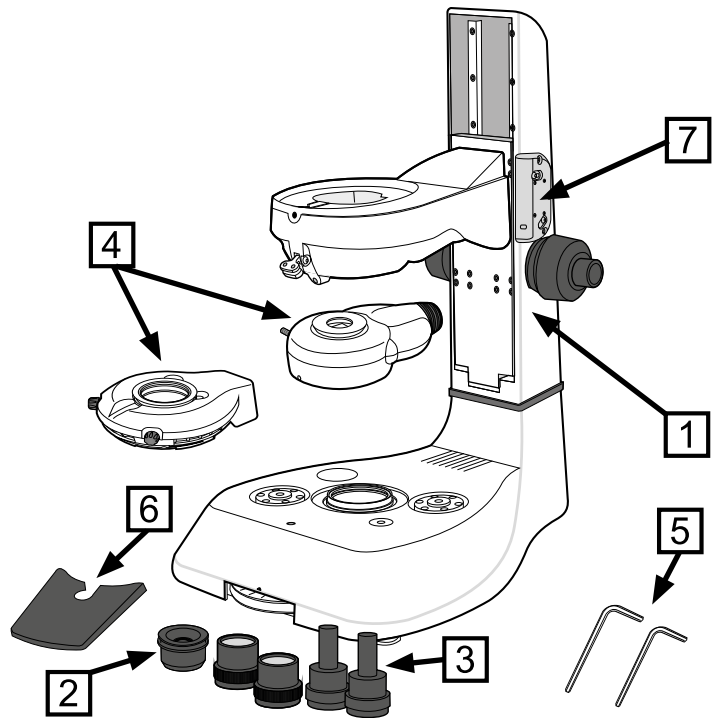
## Warranty

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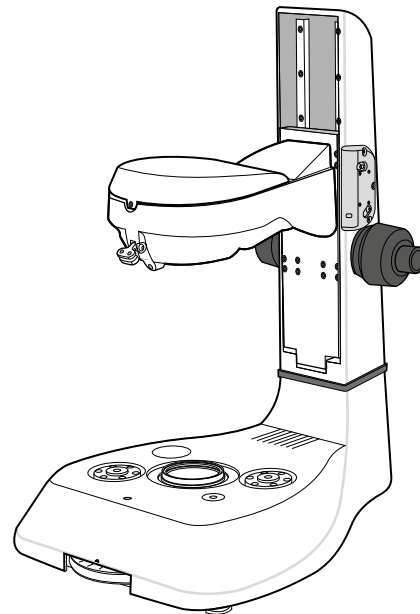
## Stand & objectives



- 1 Stand
- 2 Lens mount
- 3 Lens options
- 4 Illuminator options
- 5 Toolkit
- 6 Anti-glare shield
- 7 Z Axis upgrade kit (optional)



## Swift PRO Cam

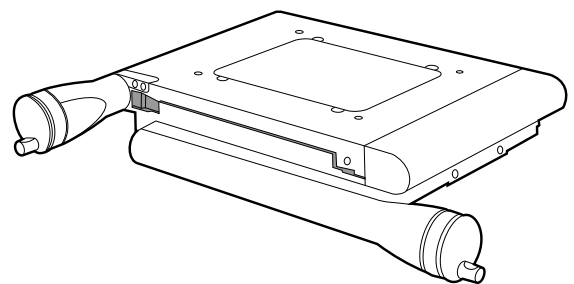


## Stage

150mm x 100mm manual stage

OR

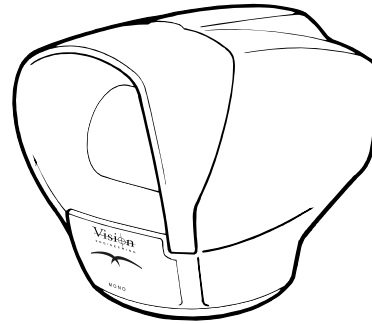
200mm x 100mm manual stage



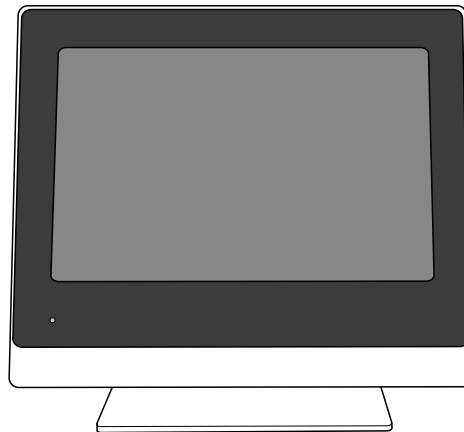
# System equipment

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Head

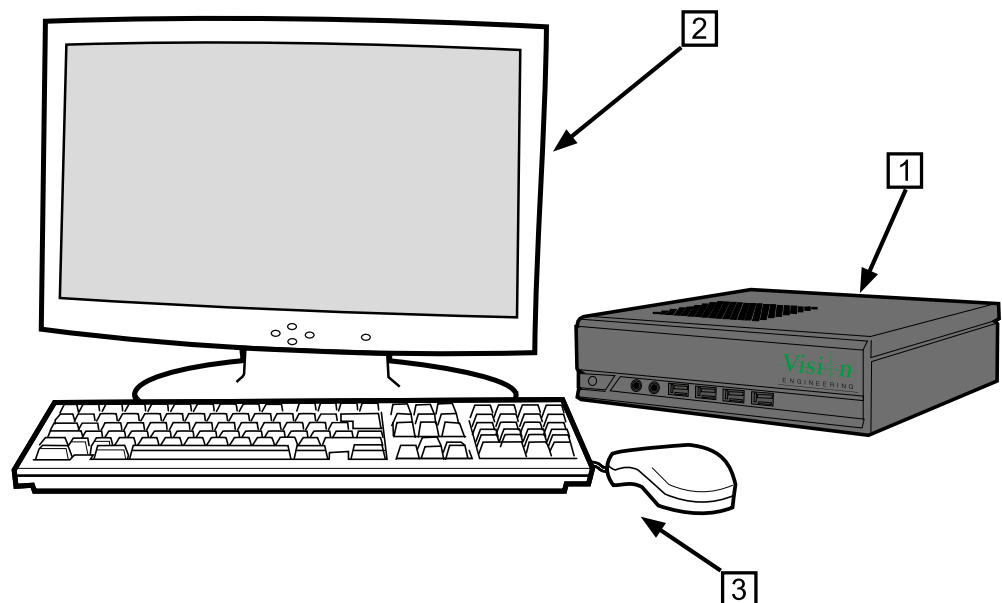


QC 3000



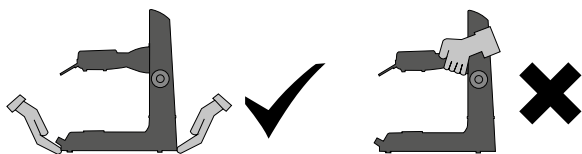
Controller

- 1 PC
- 2 Monitor
- 3 Keyboard and mouse





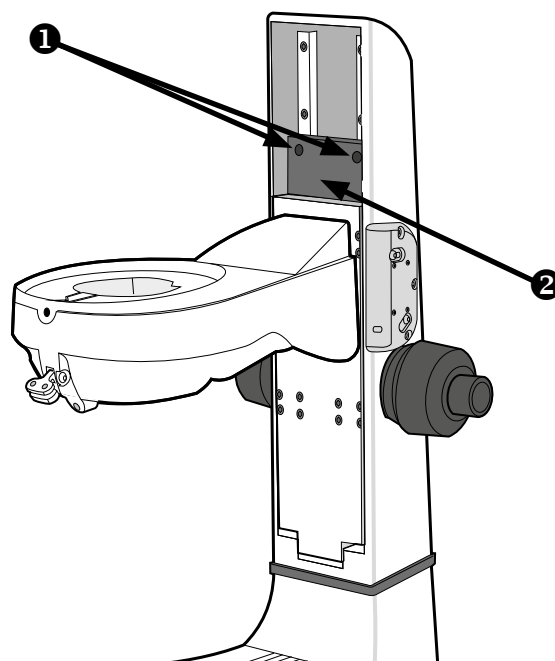
## Removing the transit protection



- ▶ Remove the two securing screws **1** and then remove the transit plate **2**.

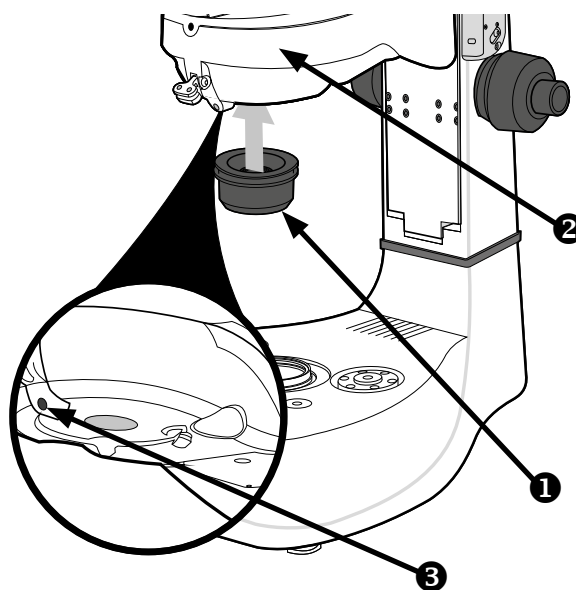
**!** Keep the transit protection for future transport of your system.

It is highly recommended that you refit the transit protection whenever you transport your system.



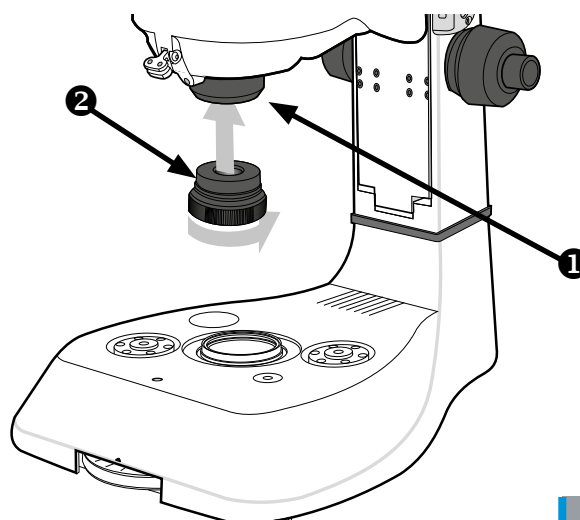
## Attaching the lens mount

- ▶ Insert the lens mount **1** up into the focus assembly **2** and secure it with the securing grub screw **3**.



## Objective lens attachment

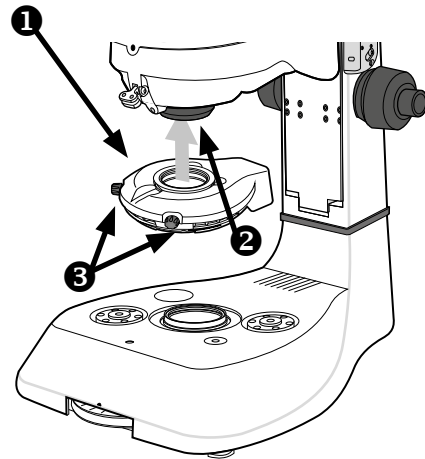
- ▶ With the lens mount **1** in place (see above).
- ▶ Place the objective lens **2** up into the lens mount and screw it into position.



## Attaching the LED ringlight

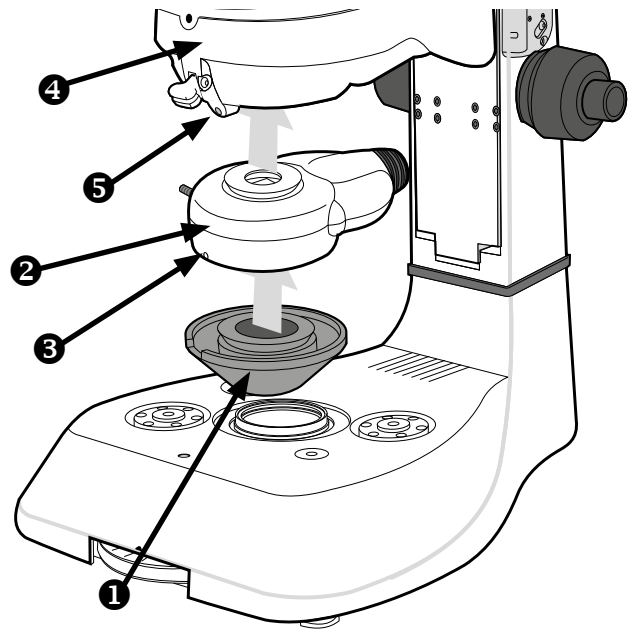
- ▶ Locate the LED ringlight **1** into position over the lens mount **2** and tighten the securing screws **3**.

**!** For connection details, see page 6.



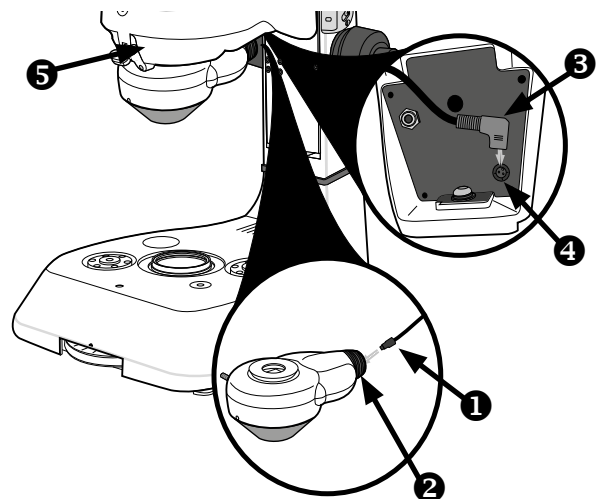
## Attaching the episcopic illuminator (EPI)

- ▶ Locate the cone **1** over the EPI **2** and secure it with the grub screw **3**.
- ▶ Locate the EPI into the focus assembly **4** and secure it with the grub screw **5**.



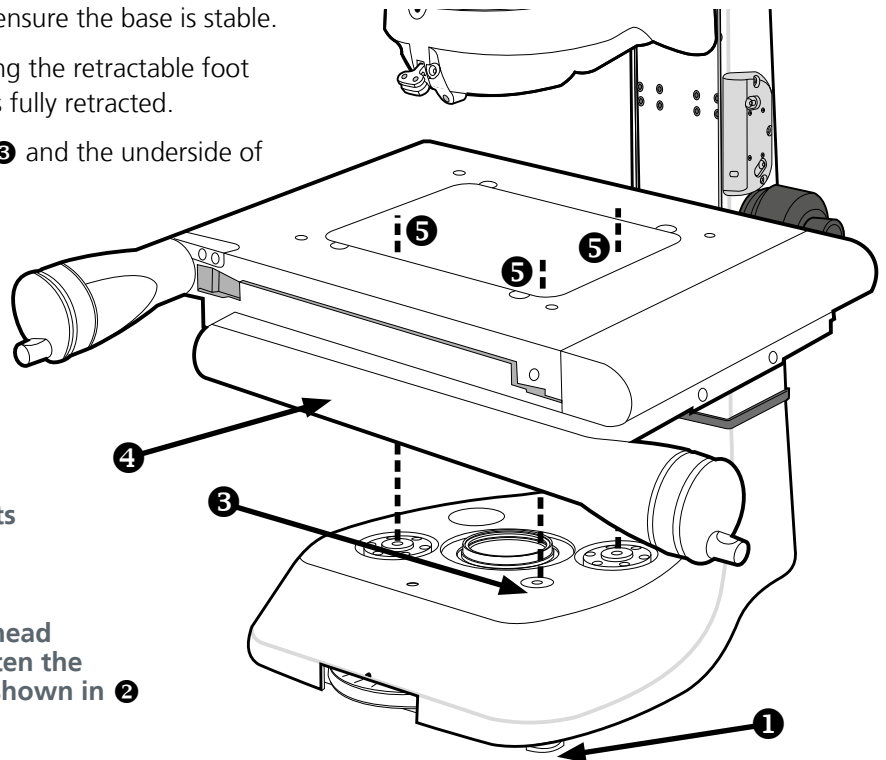
## Connecting the EPI

- ▶ Insert the appropriate end of the connection lead **1** into the EPI connector **2** and then connect the other end of the lead **3** to the connector **4** on the underside of the focus assembly **5**.



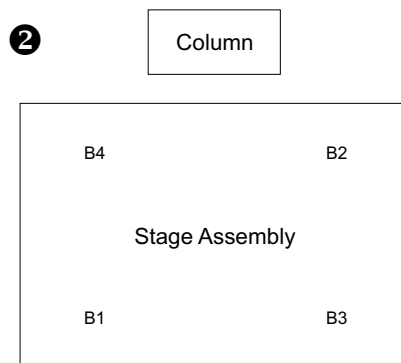
## Stage assembly (150mm x 100mm & 200mm x 100mm)

- ▶ Use the stand's levelling foot **1** to ensure the base is stable.
- ▶ Place the stage on the stand ensuring the retractable foot (position B4 in diagram **2** below) is fully retracted.
- ▶ Check the stand stage mount feet **3** and the underside of the stage **4** are clean and free of any debris.
- ▶ Loosely fit the stage bolts **5** in position B1, B2 and B3 (also in diagram **2**) to a light (finger tight) tension.

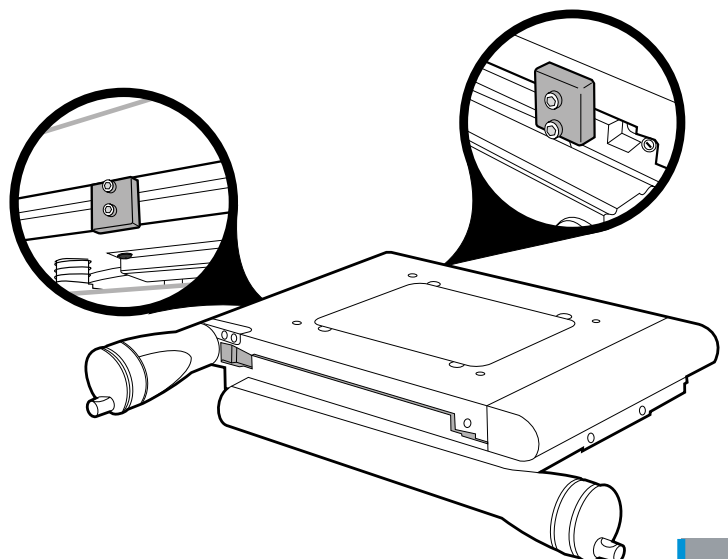


**!** If this is a video system, do not tighten the stage bolts as the stage will need to be aligned (see page 7).

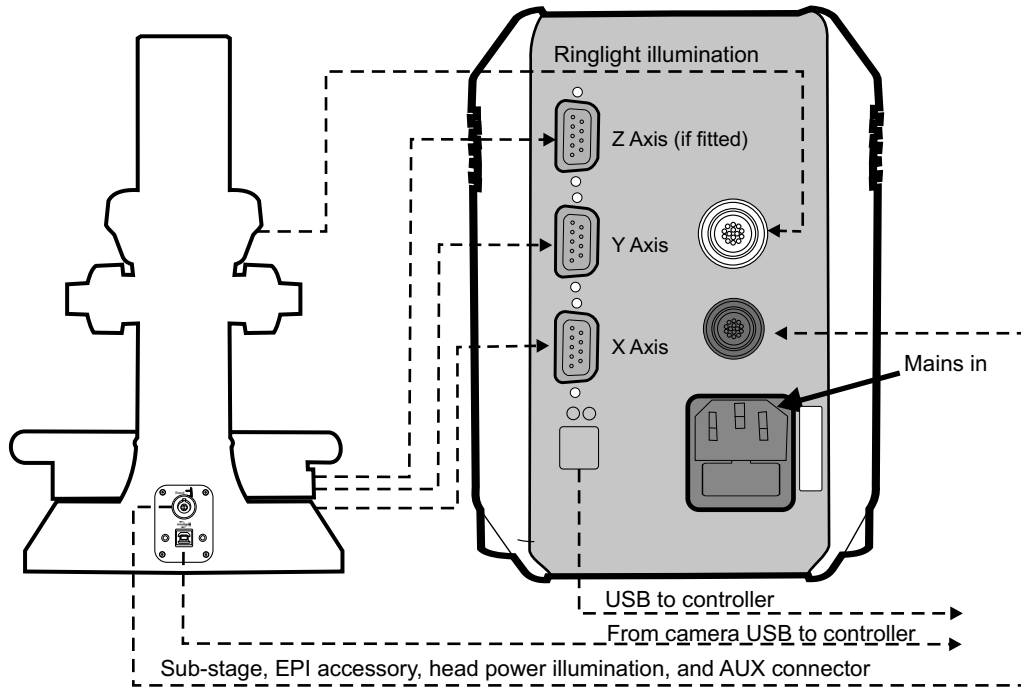
For systems with an optical head only (no video camera), tighten the stage bolts in the sequence shown in **2** to a torque of 2.8Nm.



- ▶ Remove all red transit clamps from the stage.



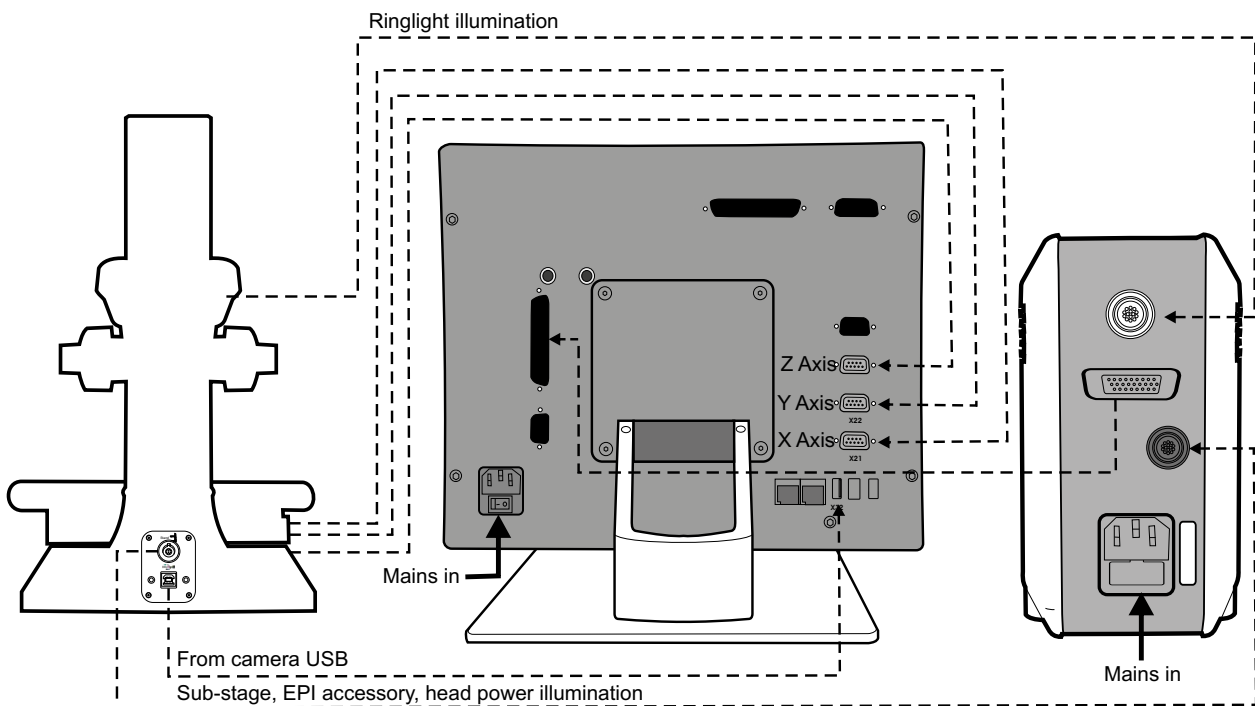
## PC system connection



**All connectors must be engaged fully and secured.**

**WARNING:** To comply with safety regulations, easy access to the mains socket must be maintained.

## QC 3000 connection

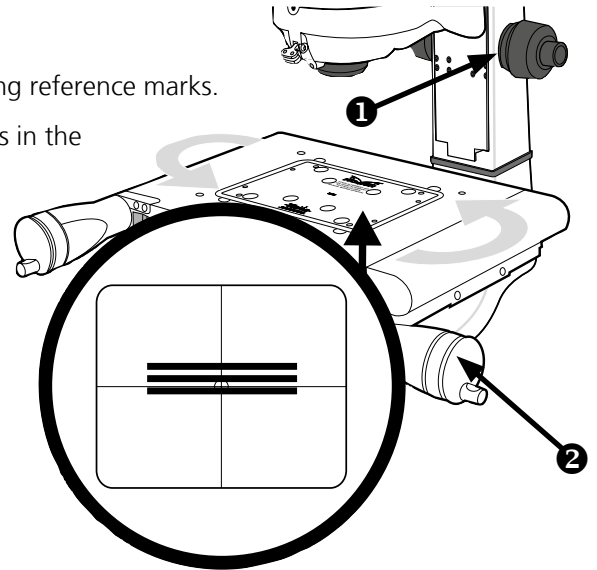


**All connectors must be engaged fully and secured.**

**WARNING:** To comply with safety regulations, easy access to the mains socket must be maintained.

## Stage alignment (video systems only)

- ▶ Turn on the system.
- ▶ Switch on the PC and follow on screen instructions for crossing reference marks.
- ▶ Using the Focus control **1**, focus on the three horizontal lines in the centre of the alignment plate attached to the stage.
- ▶ Rotate the stage by hand until the horizontal lines are parallel to the horizontal crosshair on the PC's screen.
- ▶ Use the X axis control **2** to check reference lines remain parallel with the crosshair.

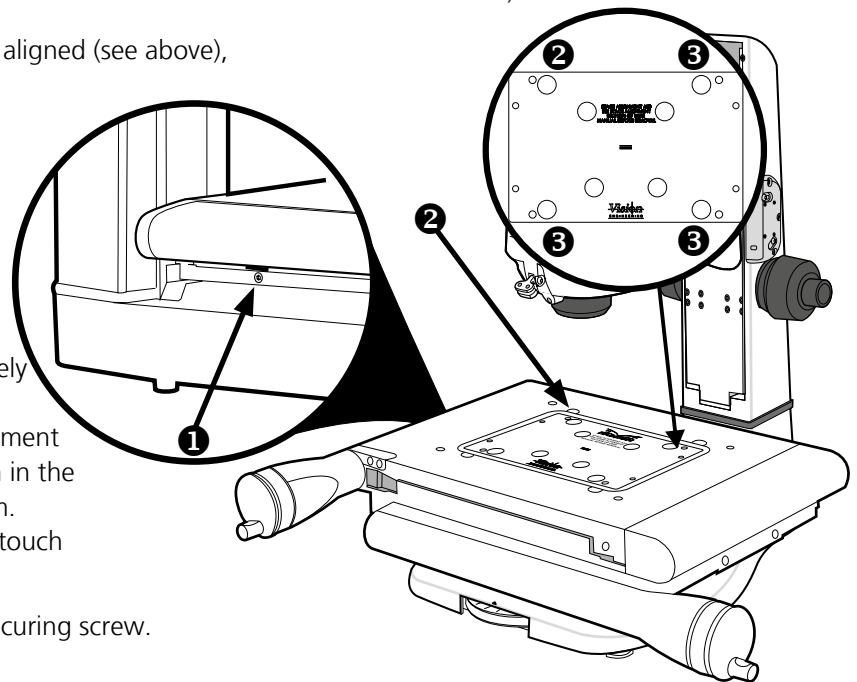


**!** Before the alignment plate can be removed the relevant stage securing procedure should be carried out.

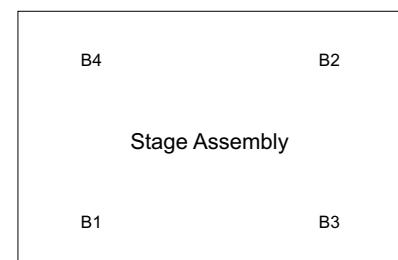
## Securing the stage (150mm x 100mm & 200mm x 100mm)

With the stage assembled (see page 5) and aligned (see above), secure the stage as follows:

- ▶ Being careful not to move the stage, loosen the floating stage foot securing screw **1**.
- ▶ Insert and screw in the last stage bolt **2** and tighten until finger tight.
- ▶ Use the Allen key supplied to progressively tighten all four screws through the appropriate holes **2** and **3** in the alignment plate in the numbered sequence (shown in the diagram **4** below) to a torque of 2.8Nm. (this is approximately equivalent to bolt touch down plus 1/8th turn).
- ▶ Lightly tighten the floating stage foot securing screw.



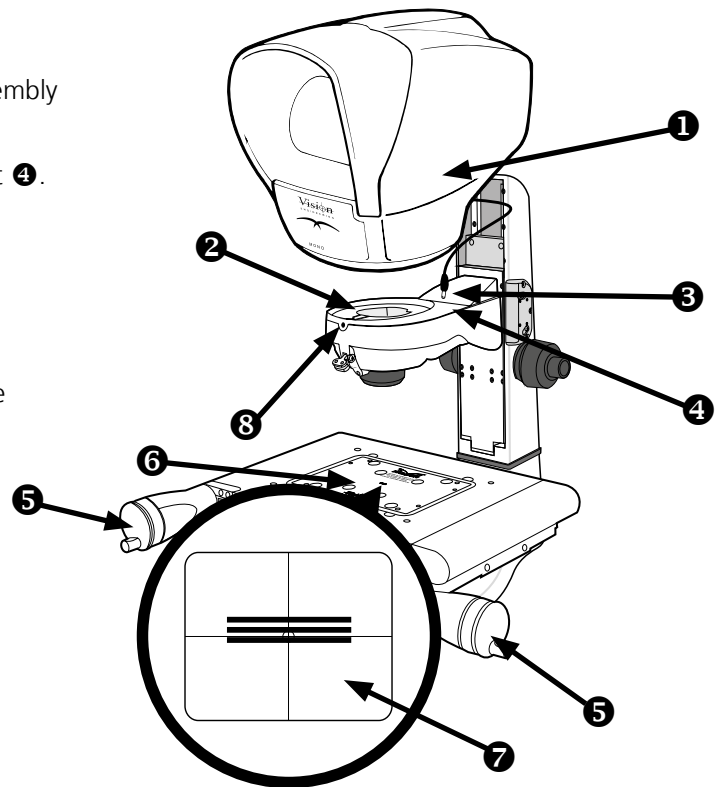
**4** Column



## Head attachment

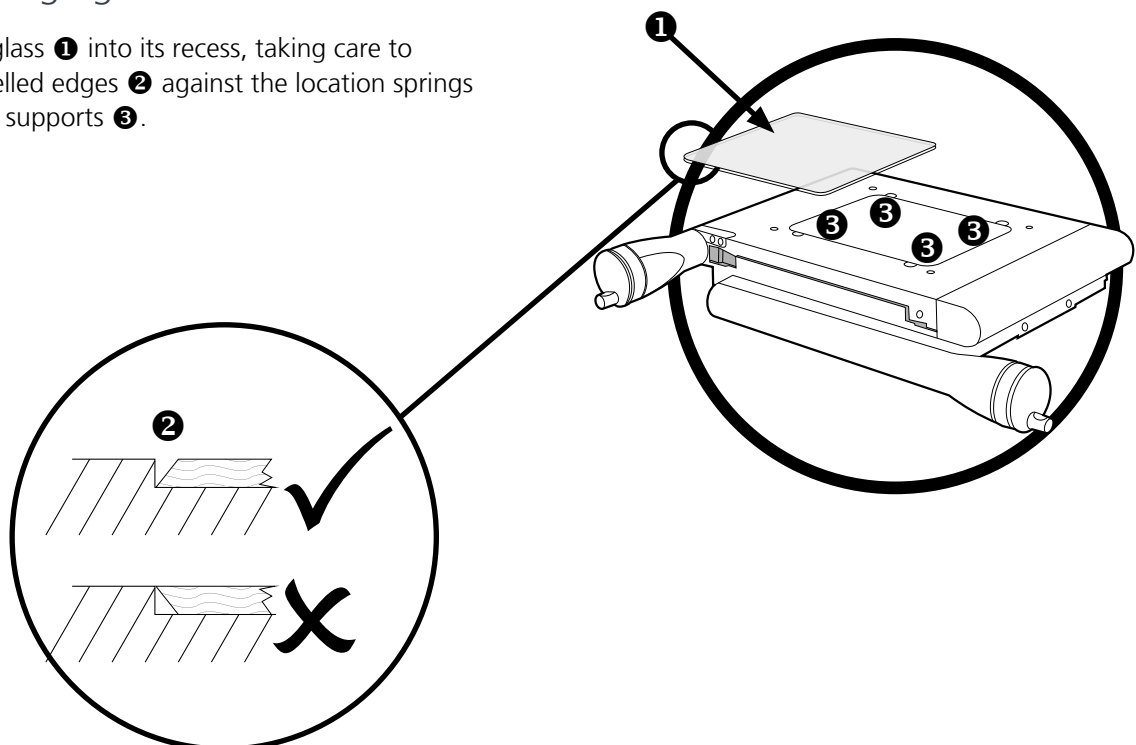
- ▶ Lower the head **1** into position on the focus assembly **2**.
- ▶ Insert the head connector **3** into the head socket **4**.
- ▶ Turn the system on using the mains switch.
- ▶ Use the X and Y stage controls **5** to centre the alignment plate **6** in the viewing screen.
- ▶ Turn the head to align the head crosshair with the alignment plate (see inset **7**).
- ▶ Tighten the securing screw **8**.
- ▶ Remove the alignment plate.

**!** If you need to remove the stage for any reason, re-attach the alignment plate and ensure the horizontal lines are parallel to the horizontal crosshair before removing the stage.



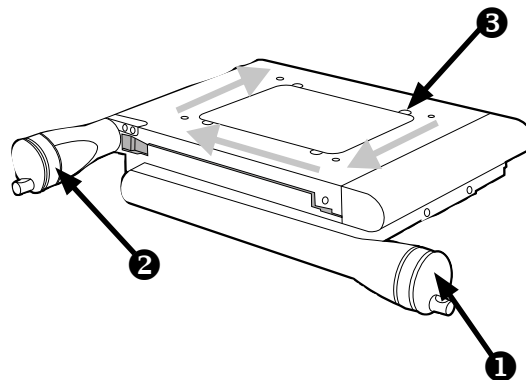
## Fitting the stage glass

- ▶ Fit the stage glass **1** into its recess, taking care to locate its bevelled edges **2** against the location springs and on to the supports **3**.



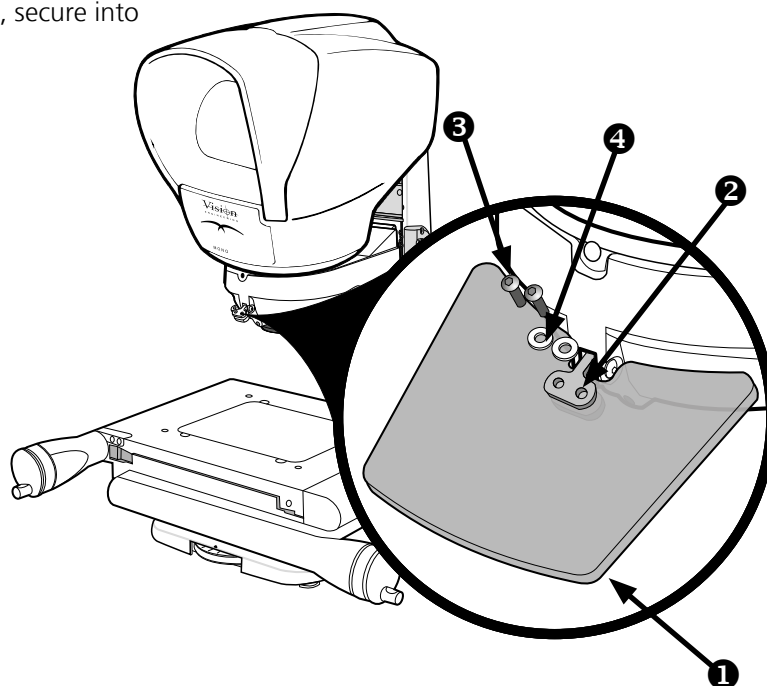
## Stage glass levelling

- ▶ Use the X axis **1** and Y axis **2** controls to bring the rear right-hand corner of the stage glass (fixed corner) **3** into view.
- ▶ Use the focus control to bring the glass surface into sharp focus.
- ▶ Use the axis controls to bring the front right-hand corner into view. Use the relevant adjustable glass support to bring the surface of the glass into sharp focus.
- ▶ Repeat for the remaining 2 corners.
- ▶ Repeat the above steps if necessary until all 4 corners are in focus.



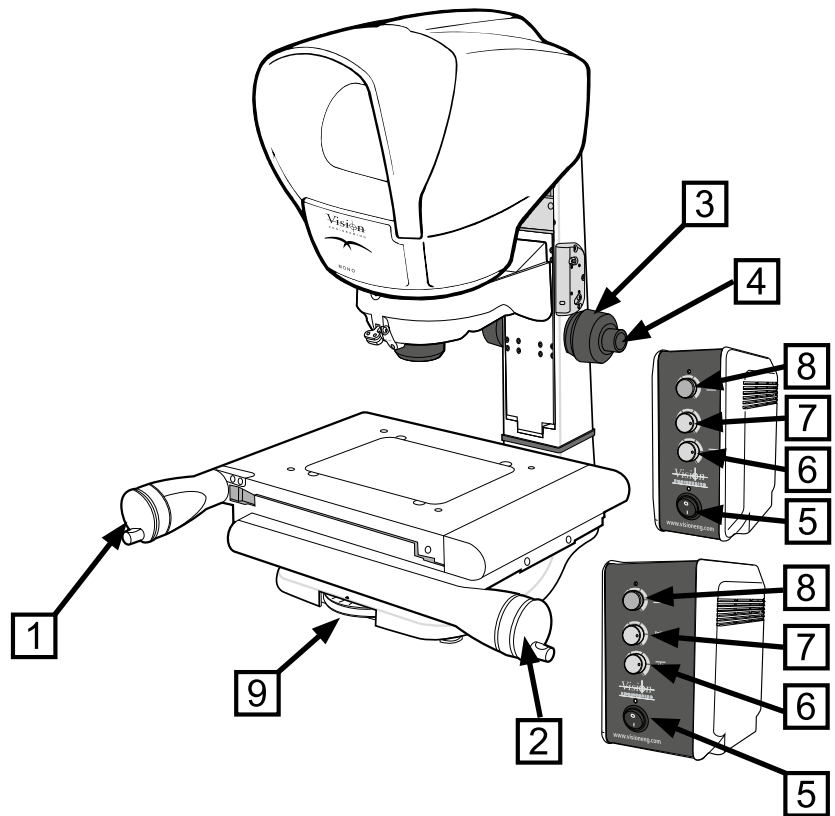
## Anti-glare shield attachment

- ▶ Slide the anti-glare shield **1** into the mounting bracket **2**.
- ▶ Using the screws **3** and washers **4** provided, secure into position with the Allen key (also provided).
- ▶ Remove the protective film from the shield.



## Main system controls

- 1 Y axis control
- 2 X axis control
- 3 Coarse focus control
- 4 Fine focus control
- 5 On/off switch
- 6 Substage light dimmer
- 7 Episcopic light dimmer
- 8 Ringlight dimmer
- 9 Iris control



**!** All desktop control systems configured by Vision Engineering for this product are set with the following password:

**Vision**



## Getting the most from your system

### Routine maintenance

- The outside of the instrument should be wiped down with a damp cloth to remove dirt and dust.
- The instrument and accessories should be checked for loose or damaged components.
- When not in use, protect your system with the dust cover.
- Always disassemble the system prior to moving.

### Environmental considerations

This equipment is designed for indoor use in the following conditions:

- Up to 2000m altitude
- Between 5° and 40°C ambient temperature (10° to 35° recommended limits)
- Power supply; 100-120V/ 220-240V, 50/60Hz with voltage fluctuations up to 10% of the nominal voltage
- Transient over voltages typically present on the Mains supply
- Maximum relative humidity of 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.

This system is an accurate, industrial gauging instrument. To achieve the optimum accuracy and repeatability, the following considerations should be taken into account:

- Position the system on a firm, rigid and level table.
- Avoid locating the instrument near to a source of vibration.
- Do not place the instrument close to a radiator or similar heat source.
- Do not place the instrument close to a cold temperature source such as an air conditioning unit.
- Do not position the instrument in direct sunlight, or where bright reflections will affect the image.
- The equipment should be positioned so that access to the mains input connector is always available

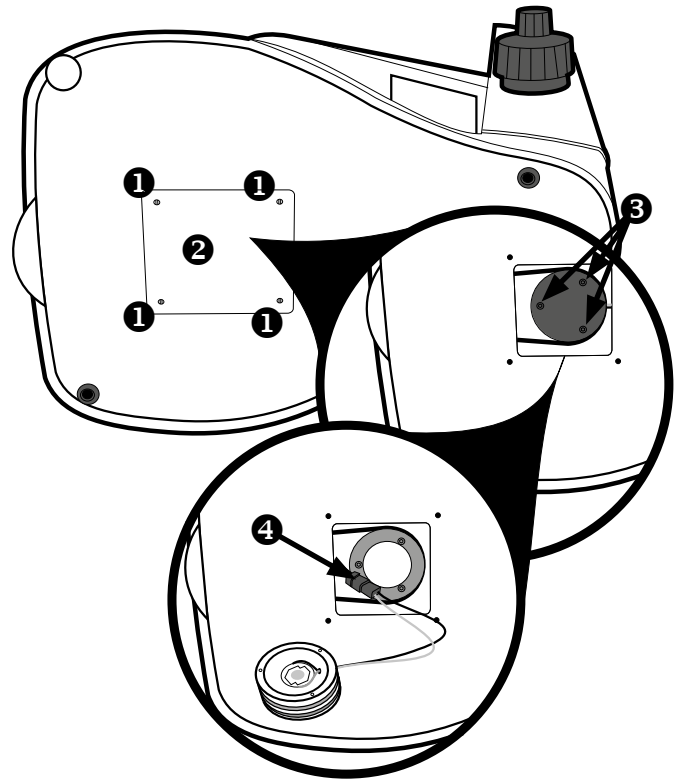


**If the system you purchased is a Video product and you purchased your own PC, Vision Engineering recommend the use of a powered USB hub for the camera signal.**

### Substage illumination LED replacement (all models)

- ▶ Disconnect the system's power supply.
- ▶ Remove the head, stage and illuminators, carefully place the unit on its side and remove the 4 LED cover plate securing screws ①.
- ▶ Remove the LED cover plate ②.
- ▶ Remove the LED securing screws ③ and remove it from the stand.
- ▶ Disconnect its flying lead from the connector ④.

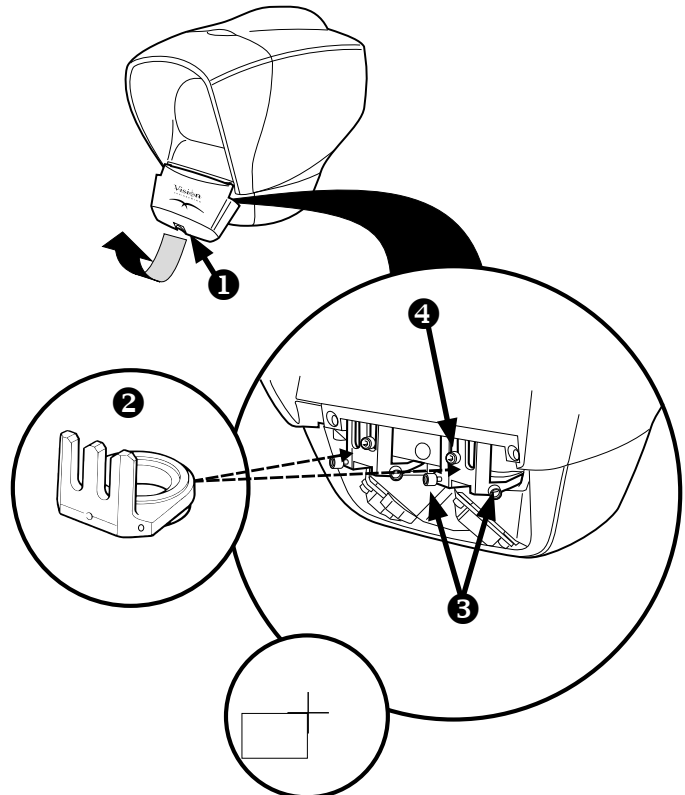
**!** To install a new LED, reverse of the removal procedure.



### Graticule fitting & adjustment

- ▶ Undo the securing clip ① at the base of the front cover and lift the cover off.
- ▶ Place the graticules ② (2 off) into position and secure them with the lock nuts and grub screws ③ (2 per graticule) and the retaining bolts ④.
- ▶ To focus and centralize each graticule, loosen the appropriate retaining knob and move the graticule up or down to focus. Re-tighten the retaining knob.
- ▶ To adjust the graticules, place a known 90° gauge (slip gauge or crossline) on the stage and focus the image. Close one eye and locate the crossline on the corner of the gauge by unlocking and adjusting the grub screws. Once the image is located, lock the grub screws with the locking nuts.
- ▶ Repeat the procedure using the other eye. Make the adjustment so that the graticules overlay each other.

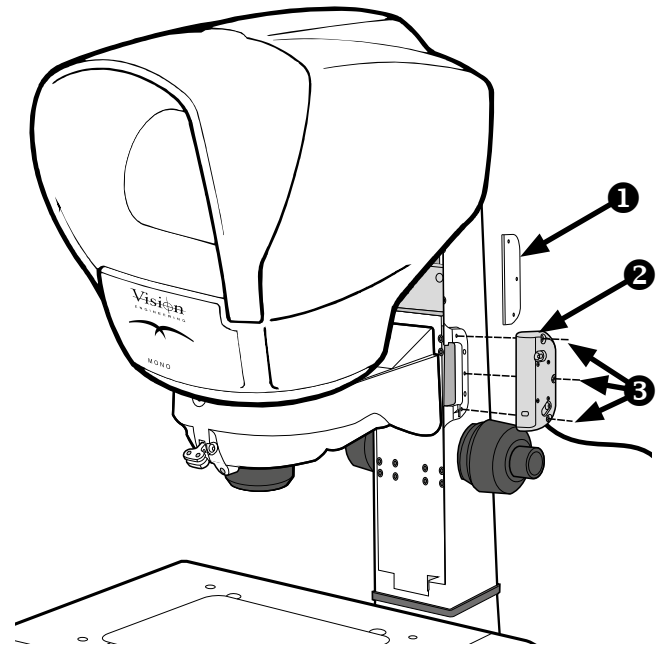
**Note:** If the image is uncomfortable to the eyes, repeat the above procedure.



## Retrofitting the Z axis module

**!** This procedure should only be carried out by authorised service personnel.

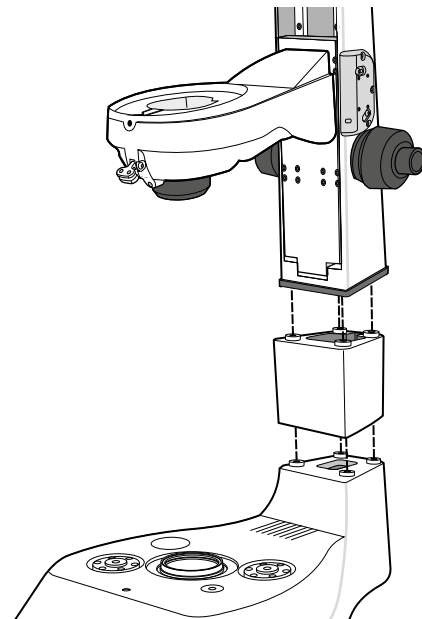
Please contact your local Vision Engineering branch for assistance



## Optional riser block

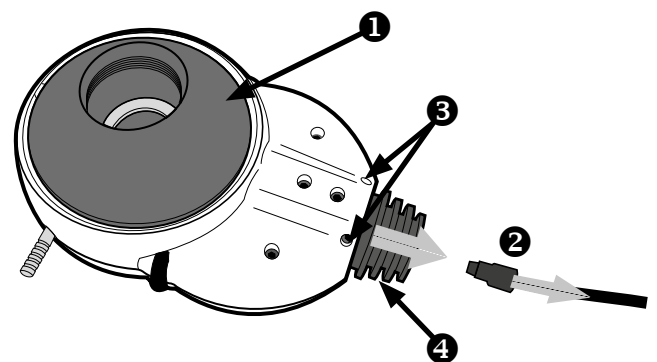
**!** This procedure should only be carried out by authorised service personnel.

Please contact your local Vision Engineering branch for assistance



## Episcopic LED replacement

- ▶ Remove the episcopic assembly **1** from the Hawk and carefully place it on a workbench as shown.
- ▶ Pull its power lead **2** clear of the socket.
- ▶ Loosen the 2 securing screws **3** and pull the LED assembly **4** clear of the illuminator.
- ▶ The replacement procedure is the reversal of the above.



# Technical specifications

## Measuring Stage

Precision measuring stage, with factory-set Non-Linear Error Correction (NLEC) calibration as standard.

(X,Y) Stage accuracy:  $5+(6.5L/1000)\mu\text{m}$

(Z) Z-axis accuracy  $10\mu\text{m}$  using controlled conditions with 200x magnification\*

## Measuring Range

(X,Y) 200mm x 100mm (10kg maximum load)

(Z) 98mm\*

## Height adjustment

100mm of height adjustment

## Encoder Resolution

X =  $1\mu\text{m}$  Y =  $1\mu\text{m}$  Z =  $0.5\mu\text{m}$ \*

## Video Camera

High resolution colour CCD video camera

## Optics (Swift PRO Duo and Elite)

Patented twin pupil monoscopic, infinity corrected optical system, with pre-centred crossline graticule to both eyes.

- Option of custom designed graticule, pre-centred to one eye

### Magnification Options (System Total)

- Quick change magnification options - 10x, 20x, 50x, 100x, 200x

## Illumination

Cool, corrected colour temperature LED surface illumination.

Iris-controlled LED substage illumination.

## PSU fuse ratings

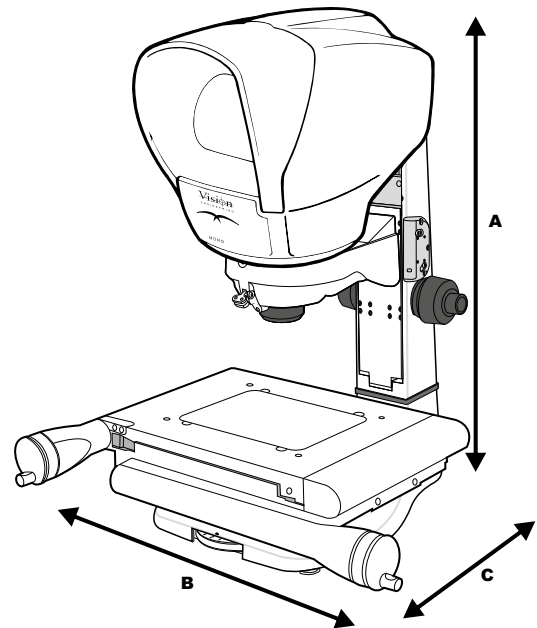
T2.5A H (2.5A slow blow (HBC) ceramic 5x20mm fuse)

\*3-axis variant only

## Dimensions

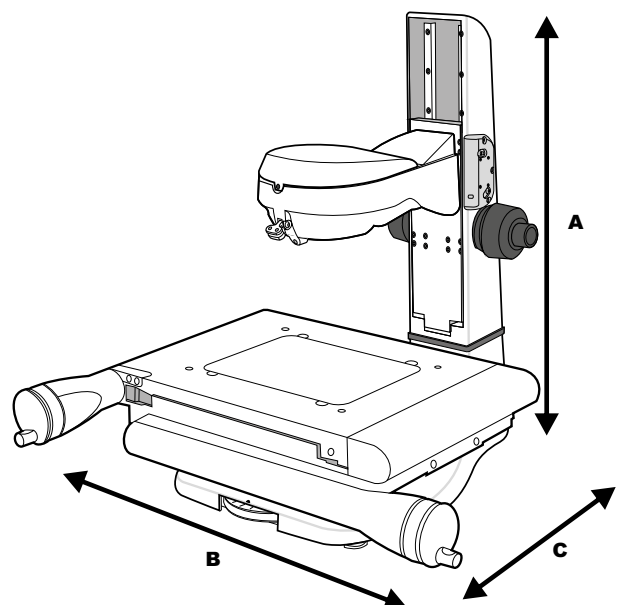
### Swift PRO Duo and Elite

- A = 680mm max.
- B = 430mm (150mm x 100mm)  
515mm (200mm x 100mm)
- C = 480mm



### Swift PRO Cam

- A = 450mm
- B = 430mm (150mm x 100mm)  
515mm (200mm x 100mm)
- C = 480mm

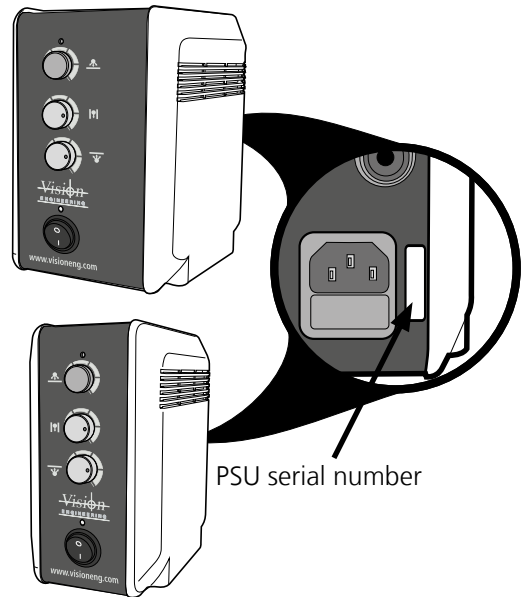
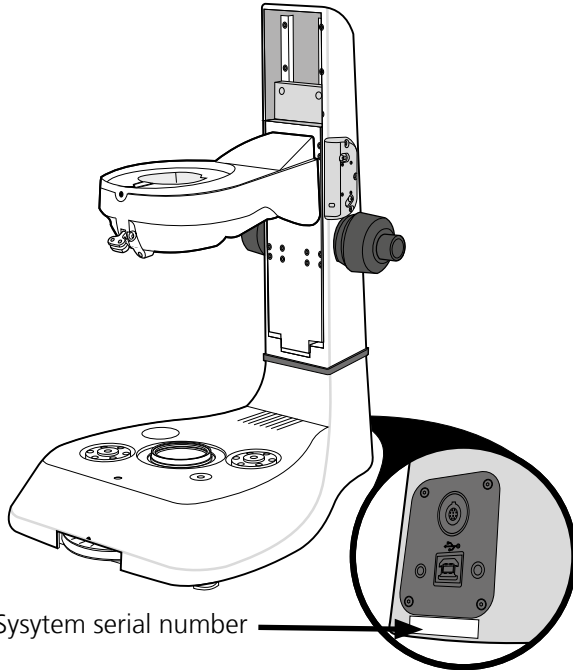
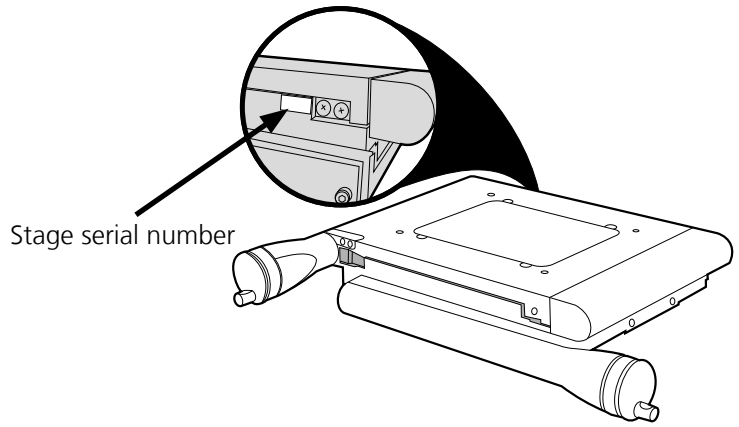


## Serial numbers

System serial number \_\_\_\_\_

Stage serial number \_\_\_\_\_

PSU serial number \_\_\_\_\_



## Service information

Service type	Comments	Date of service	Date of next service	Company	Signature





## **Warranty**

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of invoice to the original purchaser.

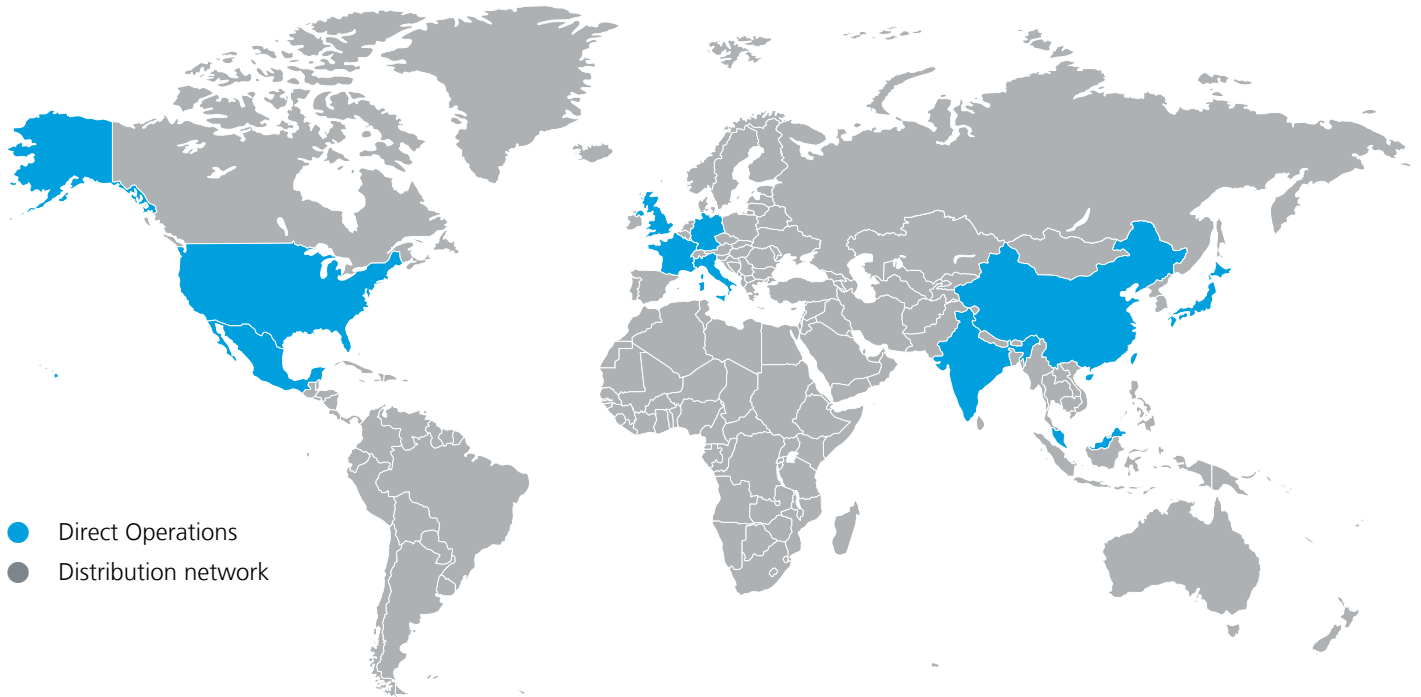
If during the warranty period the product is found to be defective, it will be repaired or replaced at facilities of Vision Engineering or elsewhere, all at the option of Vision Engineering. However, Vision Engineering reserves the right to refund the purchase price if it is unable to provide replacement, and repair is not commercially practicable or cannot be timely made. Parts not of Vision Engineering manufacture carry only the warranty of their manufacturer. Expendable components such as fuses carry no warranty.

This warranty does not cover damage in transit, damage caused by misuse, neglect, or carelessness, or damage resulting from either improper servicing or modification by other than Vision Engineering approved service personnel. Further, this warranty does not cover any routine maintenance work on the product described in the user guide or any minor maintenance work which is reasonably expected to be performed by the purchaser.

No responsibility is assumed for unsatisfactory operating performance due to environmental conditions such as humidity, dust, corrosive chemicals, deposition of oil or other foreign matter, spillage, or other conditions beyond the control of Vision Engineering.

Except as stated herein, Vision Engineering makes no other warranties, express or implied by law, whether for resale, fitness for a particular purpose or otherwise. Further, Vision Engineering shall not under any circumstances be liable for incidental, consequential or other damages.

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