

# ***KESTREL***

2 Axis Non-contact Measuring System

***Vision***  
ENGINEERING



## **Assembly, Usage & Maintenance Guidelines**





# **Kestrel 2-axis Non-Contact Measurement**

Kestrel is a 2-axis non-contact measuring system, designed specifically for shop floor gauging applications.

Vision's patented optical viewing system presents the operator with a magnified crisp, bright and undistorted view of the component to be measured. Below the Kestrel's optics the accurate XY stage is moved, allowing for features to be positioned on the central crosshair, shown in the viewing head.

A QC200 Microprocessor is connected to the Kestrel stage. Data points are entered into the Microprocessor through the integral keypad (for further details of QC200 operation, see the QC200 User Guide).

Kestrel is a modular system that can be combined with a range of accessories including alternative magnification, illumination, image capture and data processing options. For further details, contact your Vision Engineering representative or distributor.

To achieve the most from this precision instrument, please read the enclosed assembly instructions, usage and maintenance guidelines.



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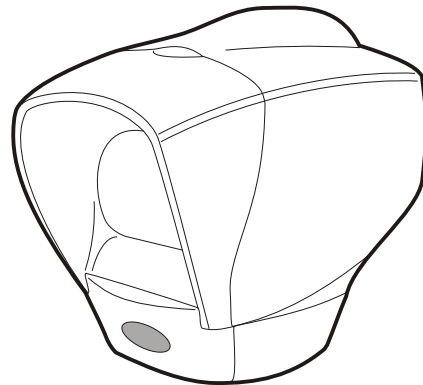
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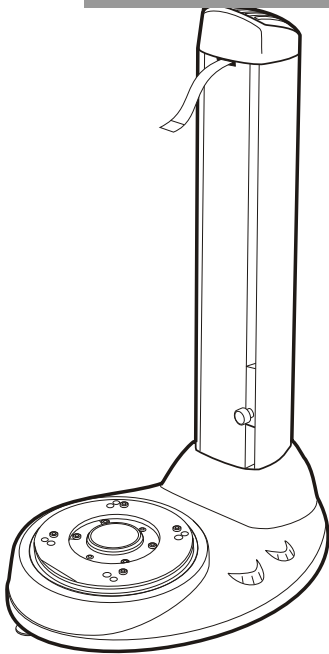
## International Contacts

Please look for the following parts in each pack. Each pack has a check list on the outside of its contents.

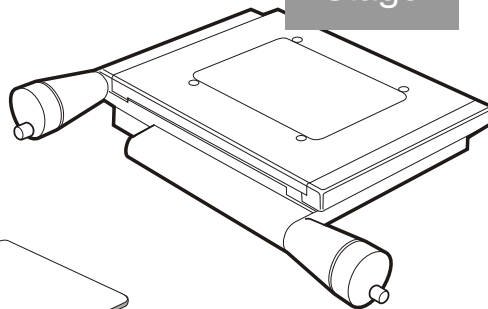
## HEAD PACK



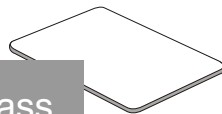
## Column & Stand



## Stage

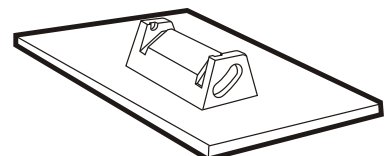
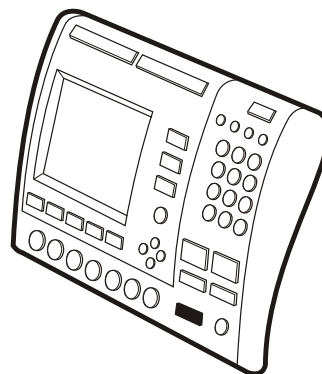


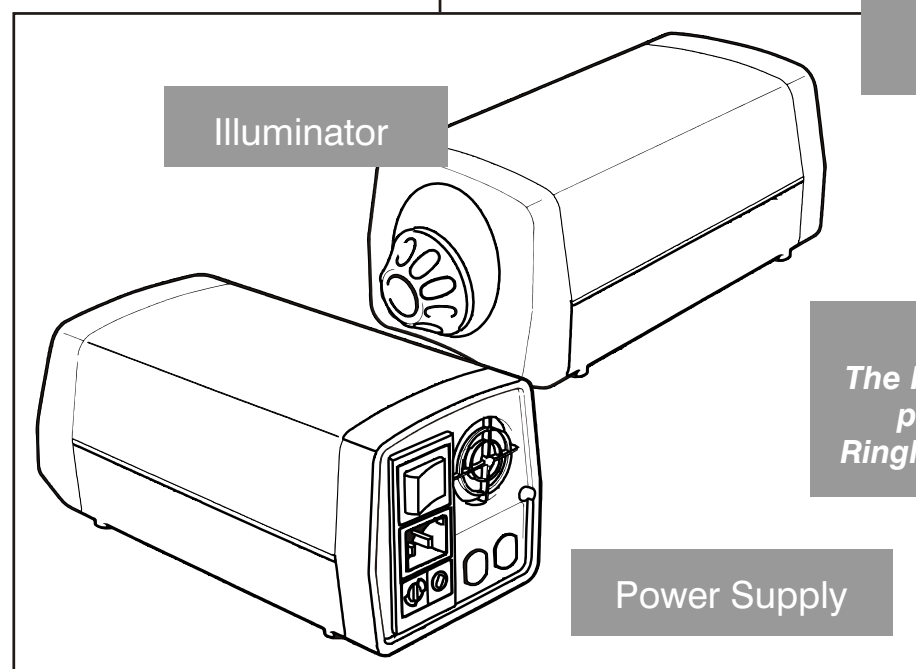
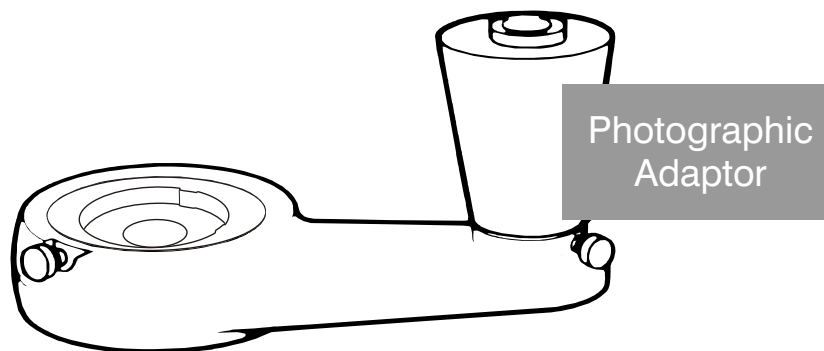
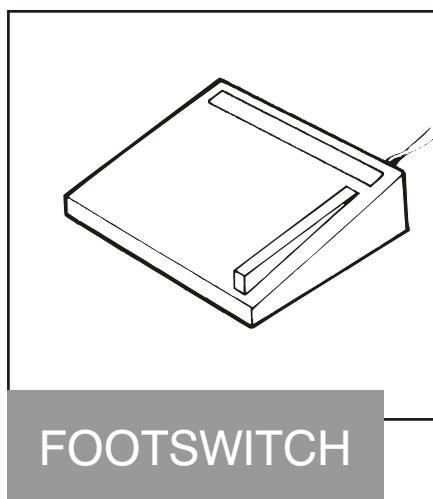
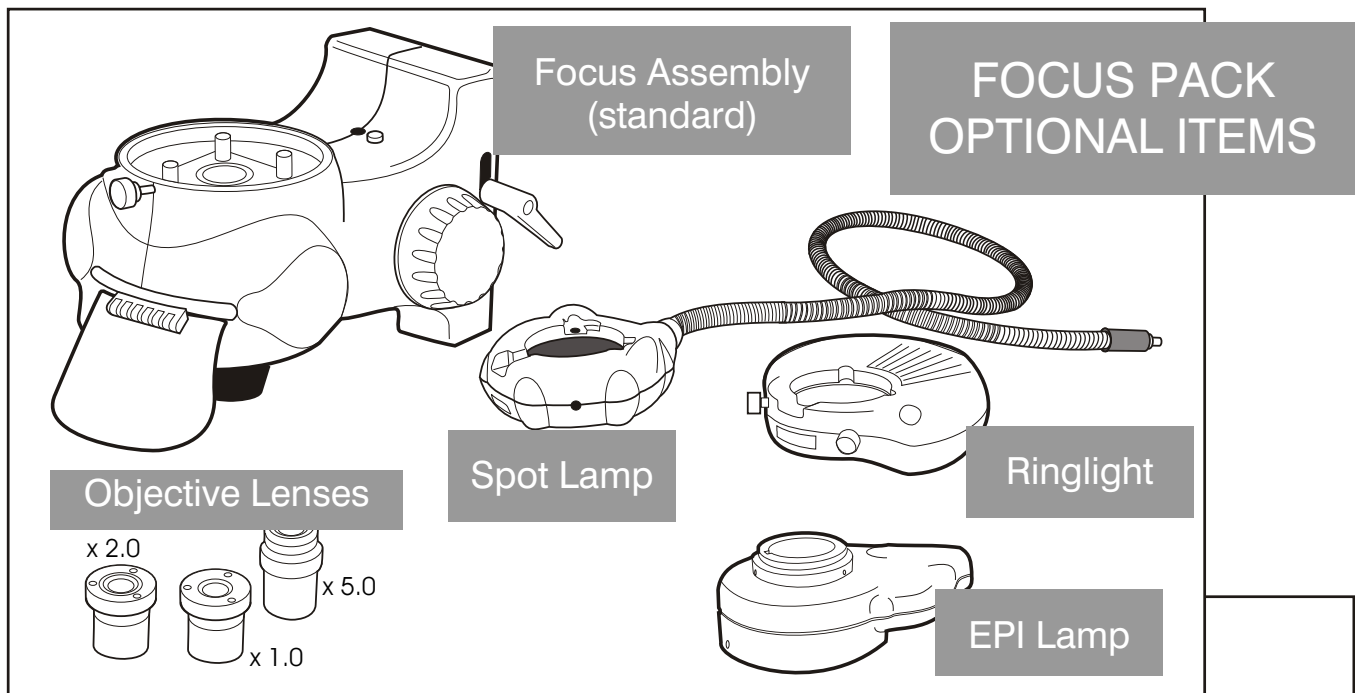
## Stage Glass



## STAGE & STAND PACK

## MICROPROCESSOR PACK





## ACCESSORIES PACKS

**NOTE:**  
The Illuminator & Power Supply  
pack is only required if a  
Ringlight and/or EPI is supplied.



## STAGE ASSEMBLY

Remove the red locking plate at the rear of the stage.

Check the adjustable pad on the stage is retracted up into the stage bottom plate. The adjustable pad is controlled by the screw in the rear left hole in the aperture under the stage glass.

Check the stand base plate and the underside of the stage are clean and free of any debris.

Place the stage on the stand base plate and align the three bolt holes. Screw in the Allen bolts until they just touch down. When all three bolts are in, tighten them to a torque setting of 2Nm (equal to 'touch down' plus  $\frac{1}{8}$  turn).

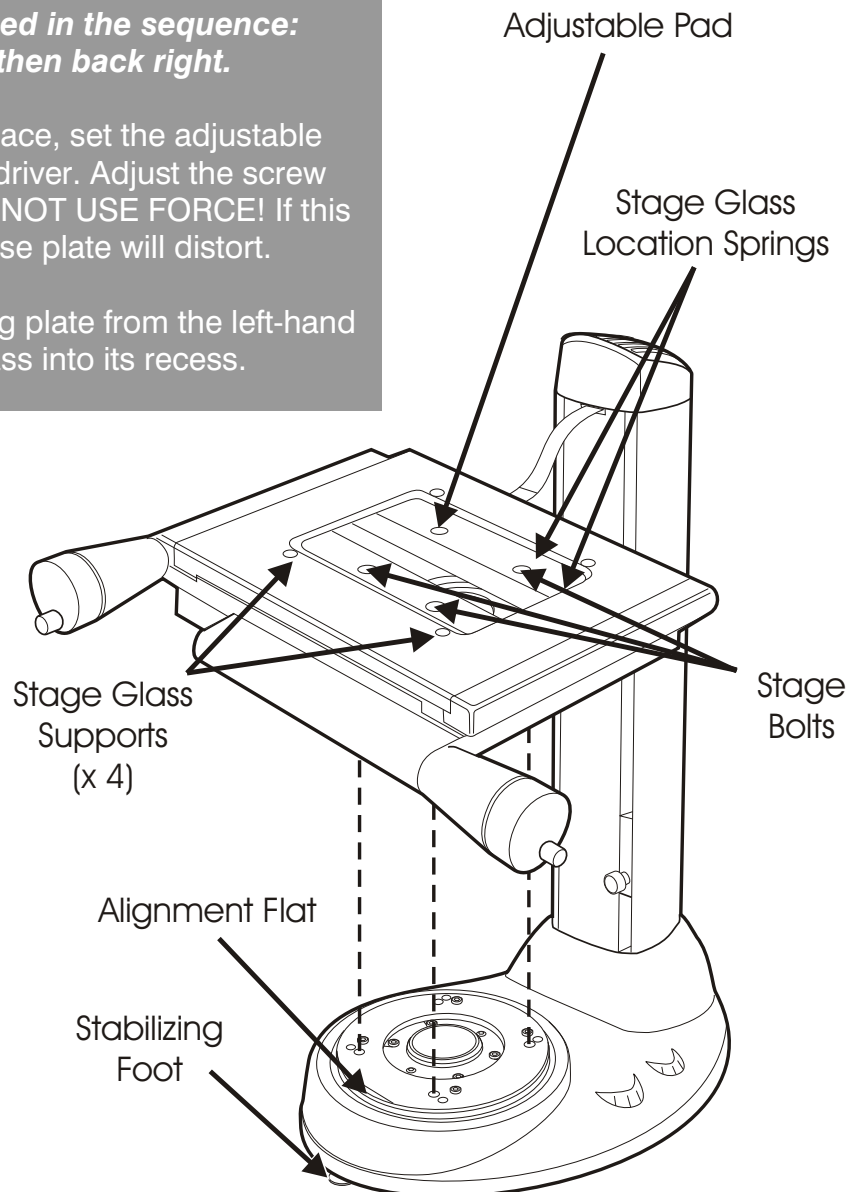
**NOTE:**

***The bolts must be tightened in the sequence: front right, front left then back right.***

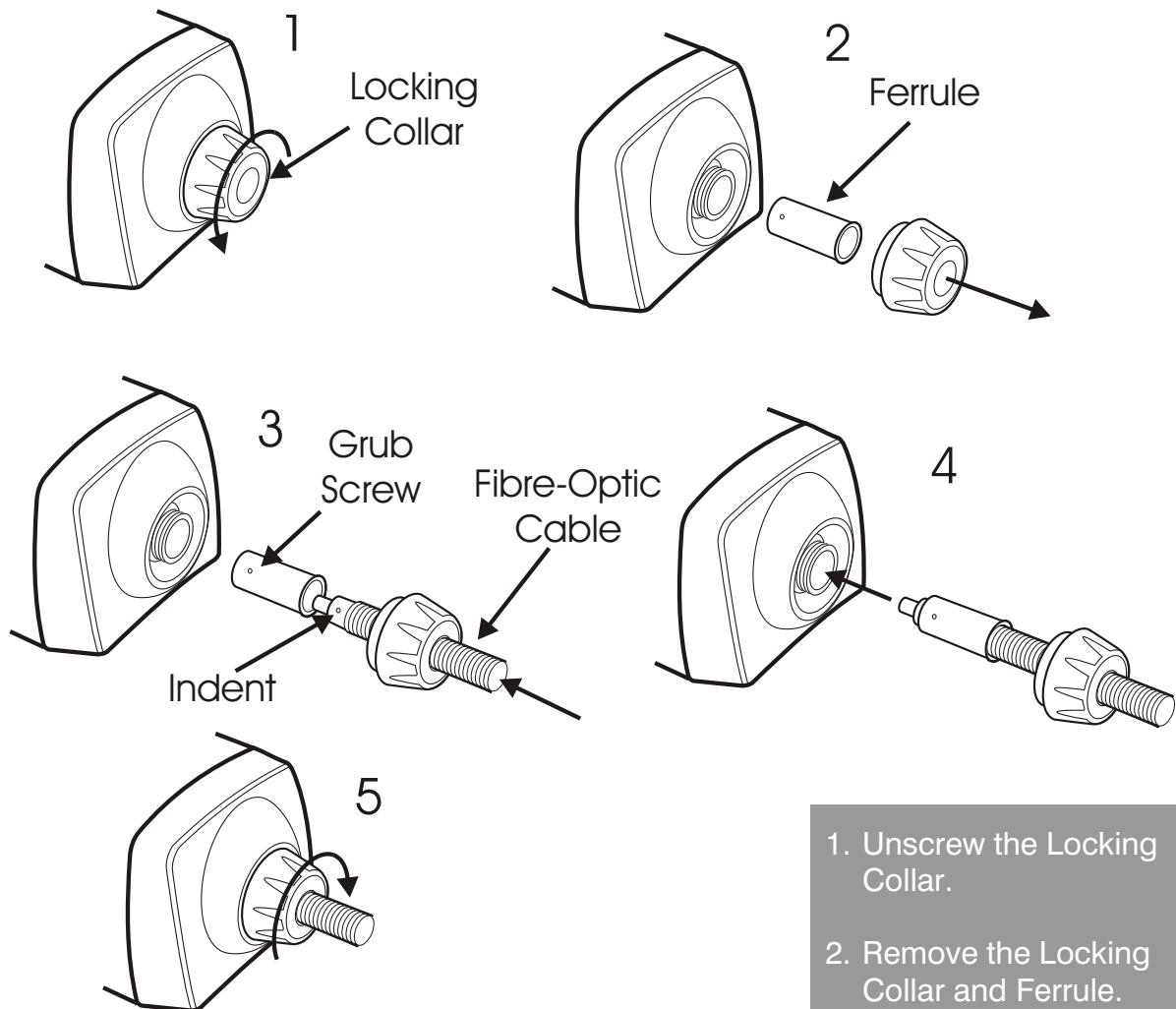
Once the 3 Allen bolts are in place, set the adjustable pad using a flat headed screwdriver. Adjust the screw until it just touches down - DO NOT USE FORCE! If this screw is over tightened, the base plate will distort.

Remove the second red locking plate from the left-hand side of the stage and fit the glass into its recess.

**NOTE:**  
***Ensure the Stage Glass is in contact with all 4 supports.***



## FIBRE-OPTIC CABLE CONNECTION



**NOTE:**  
*Only for Ringlight/EPI options*

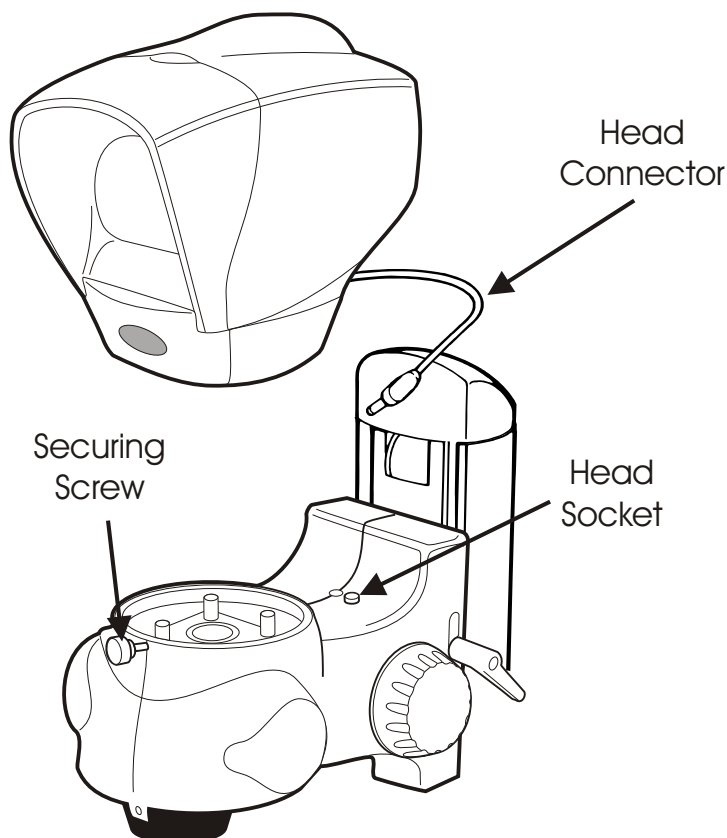
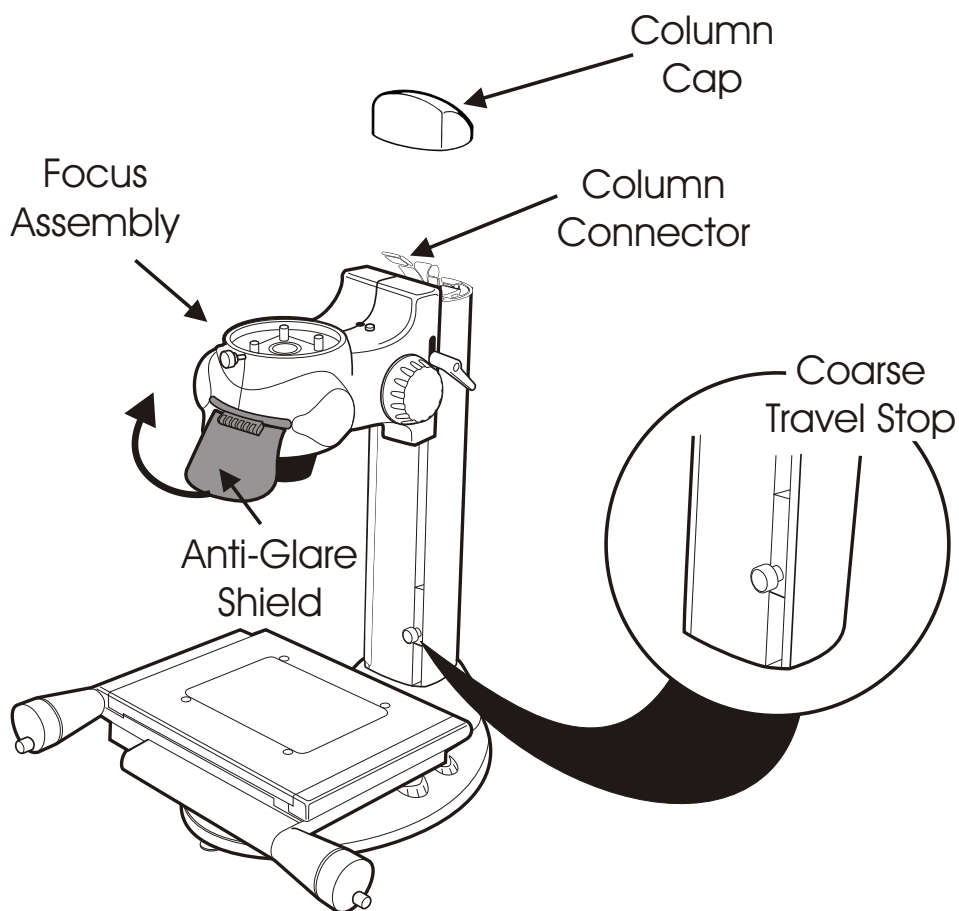
1. Unscrew the Locking Collar.
2. Remove the Locking Collar and Ferrule.
3. Insert the Fibre-Optic cable through the Collar and Ferrule. Align the Grub Screw with the indent on the cable and tighten the screw with the Allen key provided (taped to the base of the illuminator).
4. Insert the cable and Ferrule into the illuminator.
5. Tighten the Collar.

## FOCUS ASSEMBLY ATTACHMENT

Ensure the Coarse Travel Stop is at its lowest position and the Anti-Glare Shield is raised.

Remove the Column Cap. Slide the assembly on to the column just enough to allow the column connector to be attached to the male connector at the rear of the assembly. Replace the Column Cap.

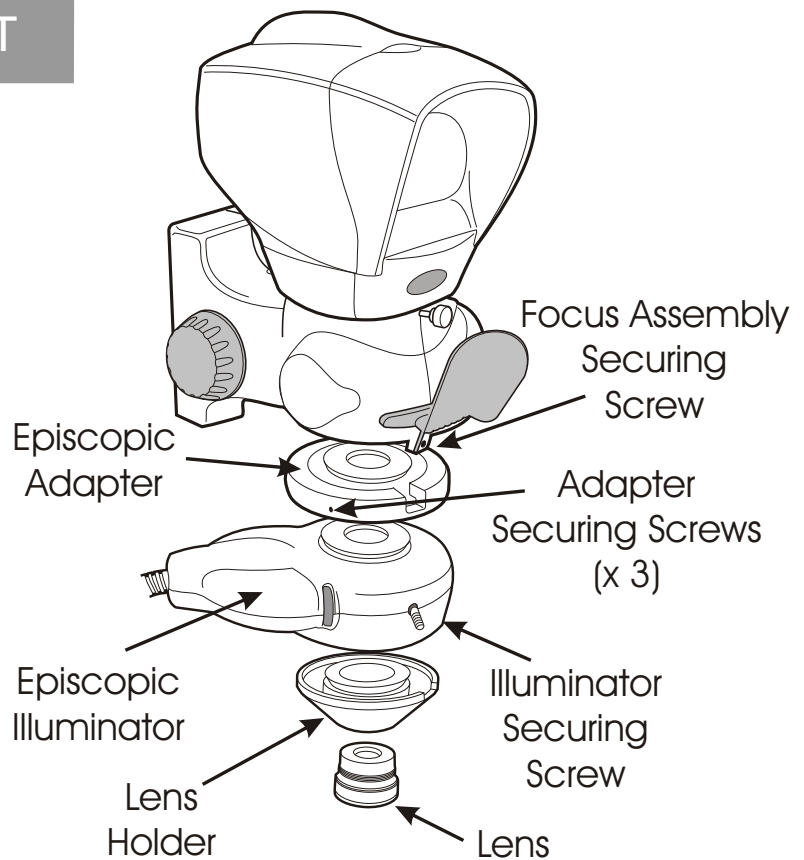
Position the Focus Assembly as required and secure it.



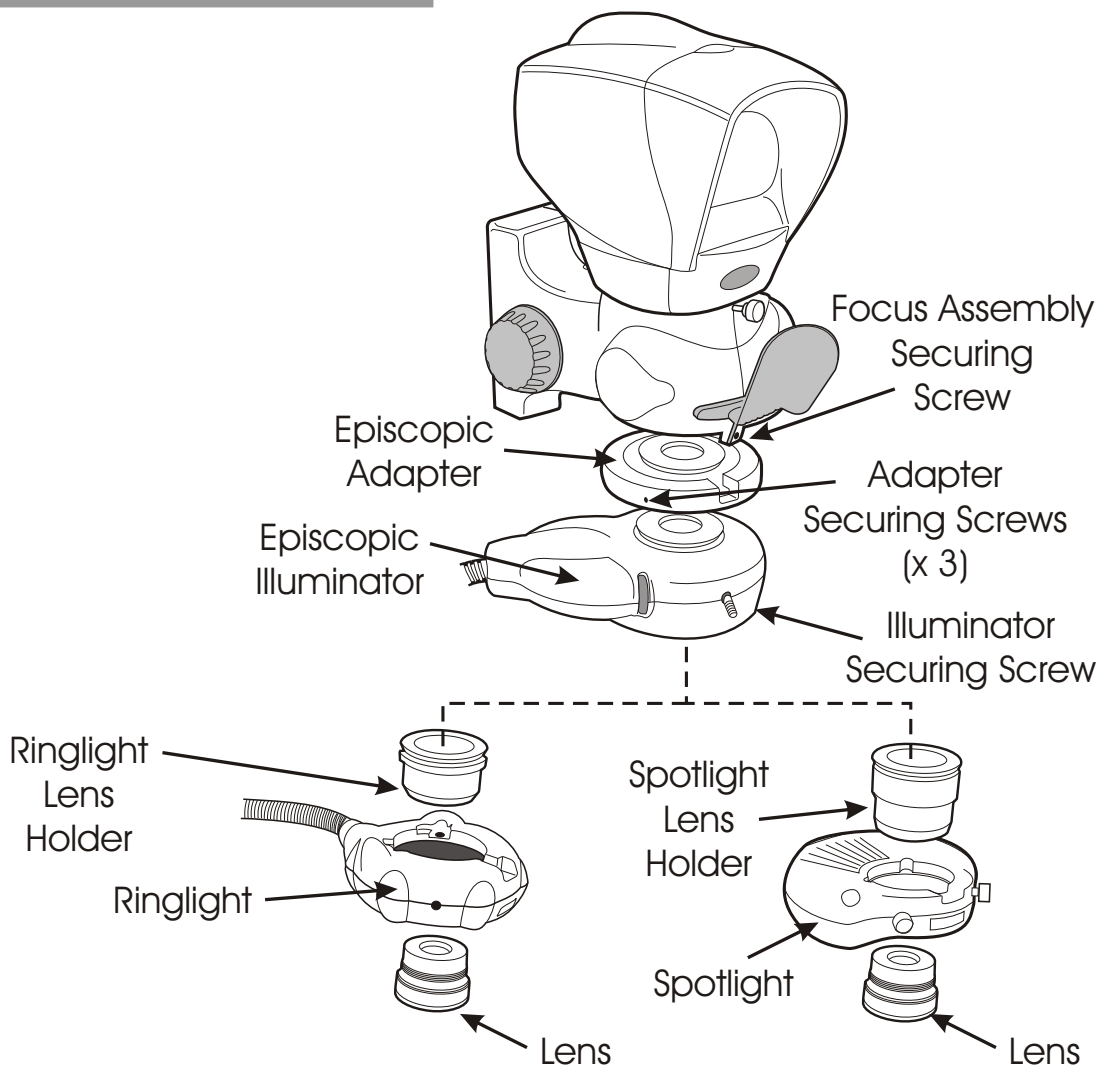
## ATTACHING HEAD

Place the Head on to the Focus Assembly. Adjust Head until the crossline is parallel with the stage movement in the X axis. Tighten the securing screw. Insert the Head Connector in the Head Socket.

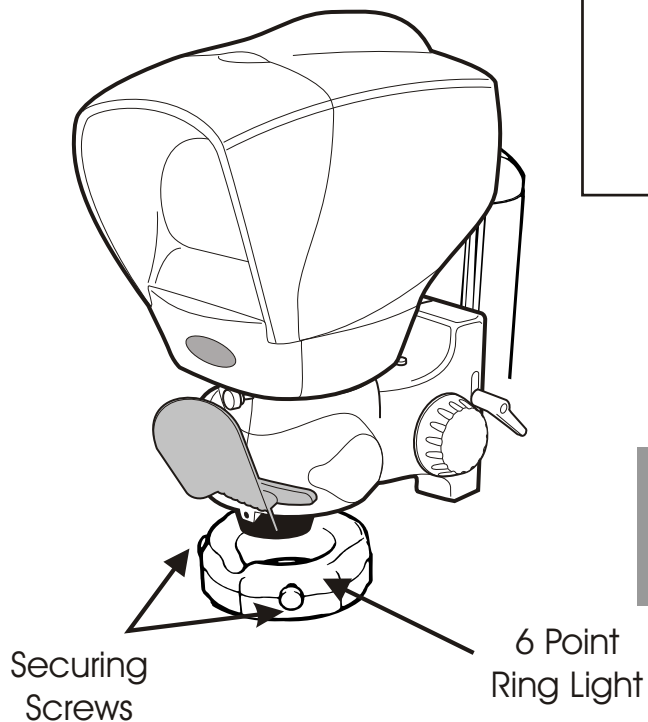
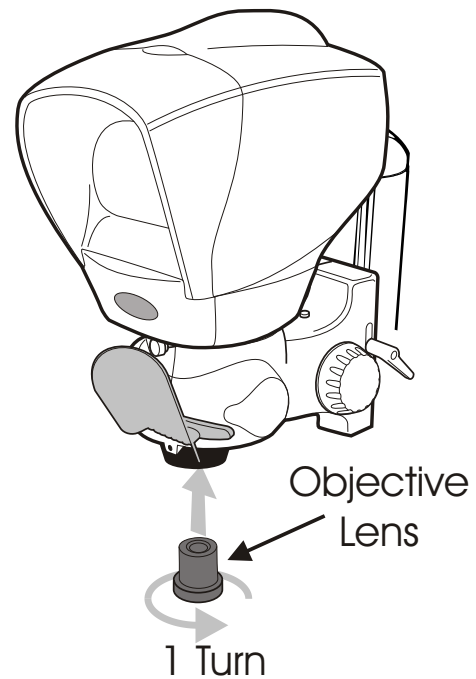
## EPI ATTACHMENT



## RINGLIGHT & SPOTLIGHT ATTACHMENT (WITH EPI)



## OBJECTIVE LENS

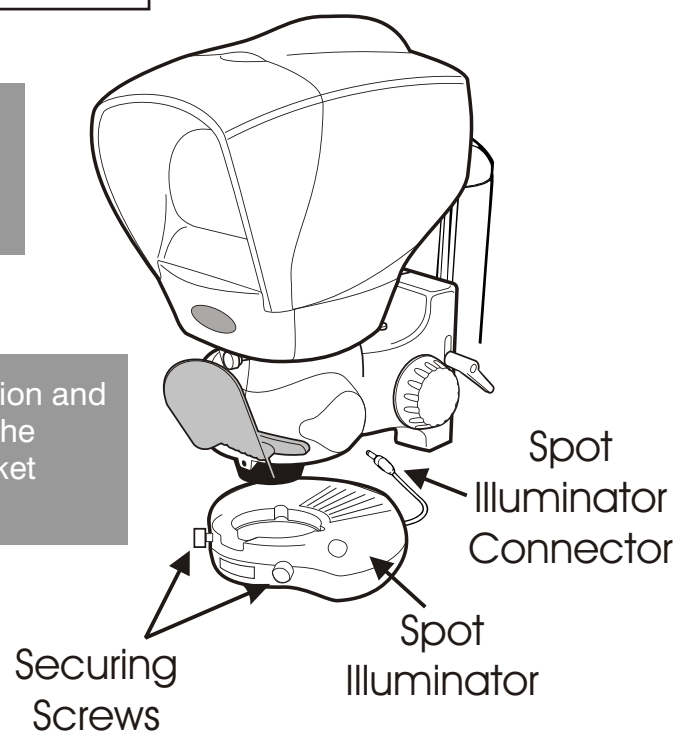


## ATTACHING 6 POINT RINGLIGHT

Place the ringlight into position and tighten the securing screws. Attach the fibre optic cable to the illuminator.

## ATTACHING SPOT ILLUMINATOR

Place the Spot Illuminator into position and tighten the securing screws. Insert the illuminator's connector into the socket underneath the Focus Assembly.



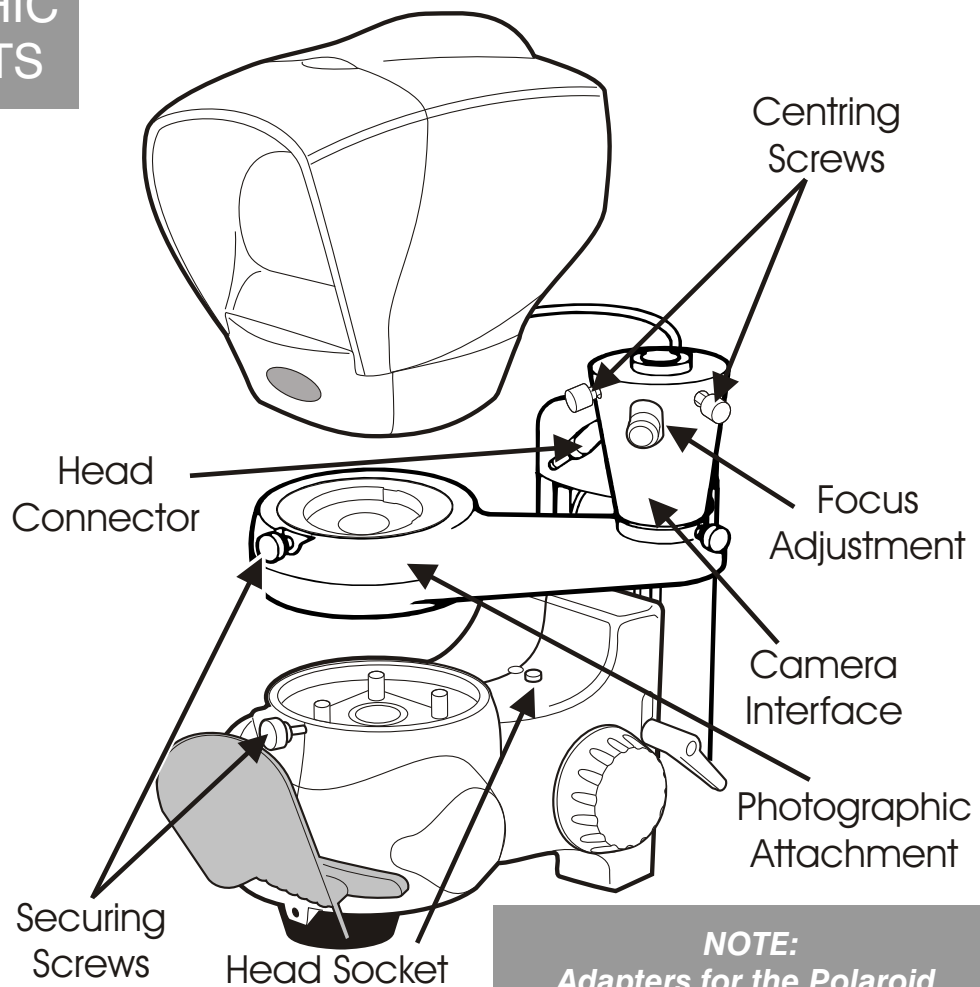
## PHOTOGRAPHIC ATTACHMENTS

Remove the Head.  
Place the  
Photographic  
Attachment  
Assembly into  
position and tighten  
the securing screw.

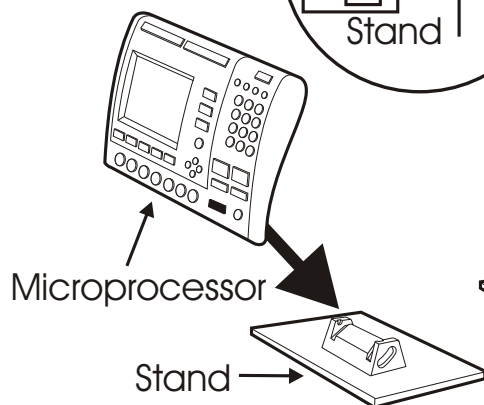
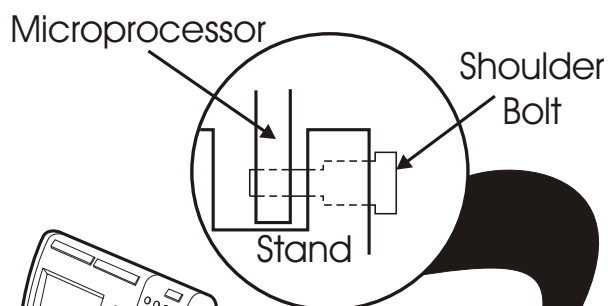
Replace the head  
on to the assembly  
and tighten the  
Head Securing  
Screw.

Attach the  
appropriate Camera  
interface to the  
Photographic  
Attachment and  
tighten the securing  
screws.

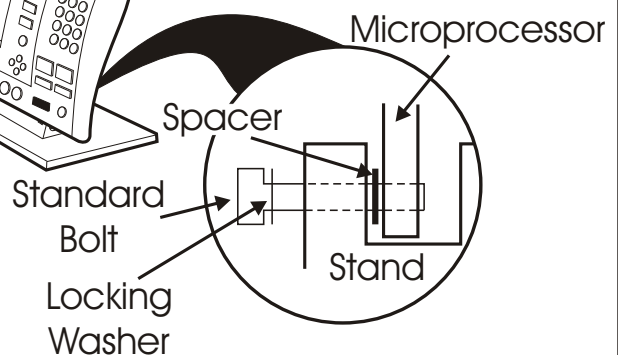
The camera  
attaches to the  
interface.



**NOTE:**  
Adapters for the Polaroid,  
35mm and CCTV/Digital  
cameras are different.



**NOTE:**  
Do Not Over-tighten

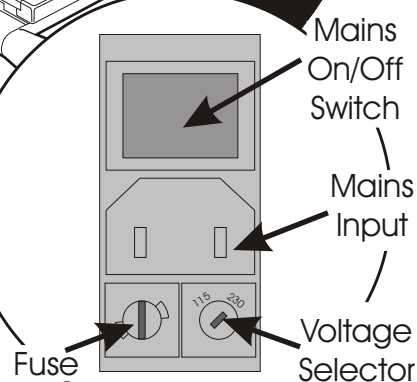
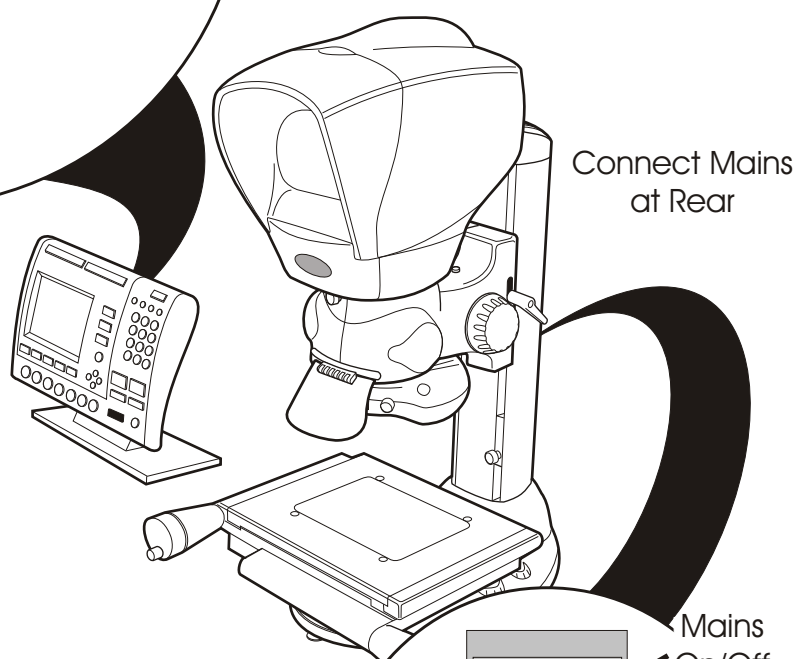
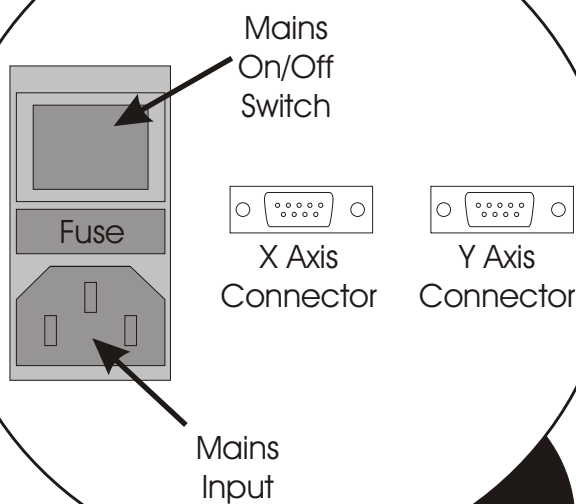


## MICROPROCESSOR ASSEMBLY

## CABLE CONNECTION

### NOTE:

*Ensure the Voltage Selector is turned to the correct setting.  
For Japan and some Far Eastern markets the voltage selector is marked 100 - 110V.*



Connect the X and Y Axis leads from the Stage to the rear of the Microprocessor as shown.

Connect the mains leads to the mains connectors on the rear of the units.

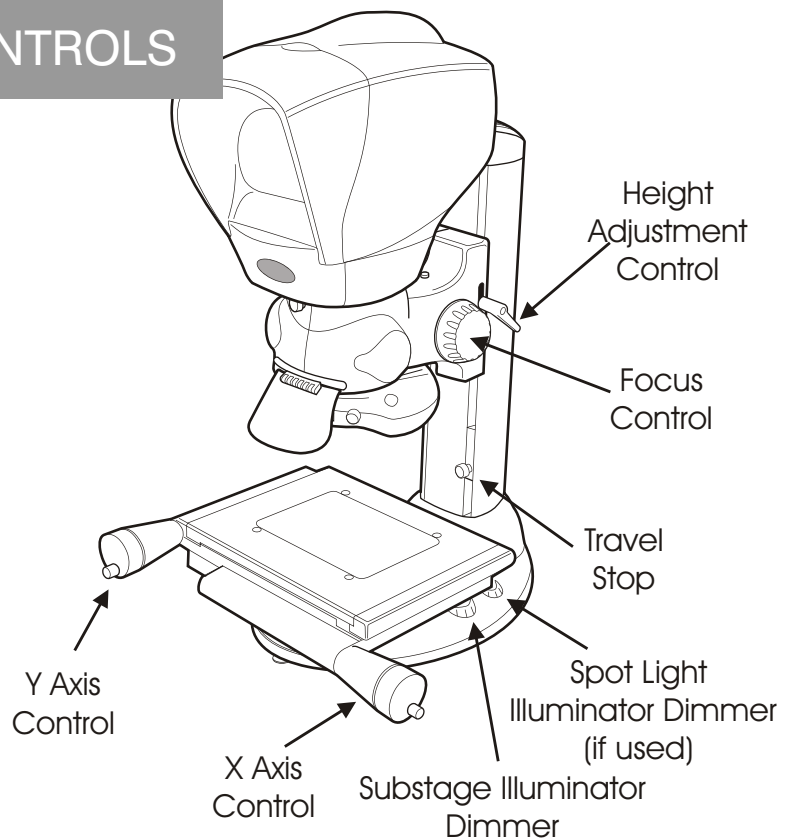


## MAIN SYSTEM CONTROLS

Switch the Kestrel On and check the red LED at the centre of the Vision logo on the front of the Head is illuminated.

Adjust the Height Adjustment Control until you can focus on the Stage Glass then adjust the Focus Control for optimum focus.

Move the Travel Stop up to the base of the Focus assembly and lock it in place.



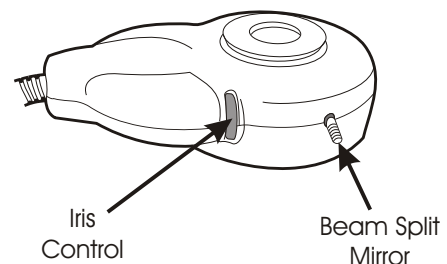
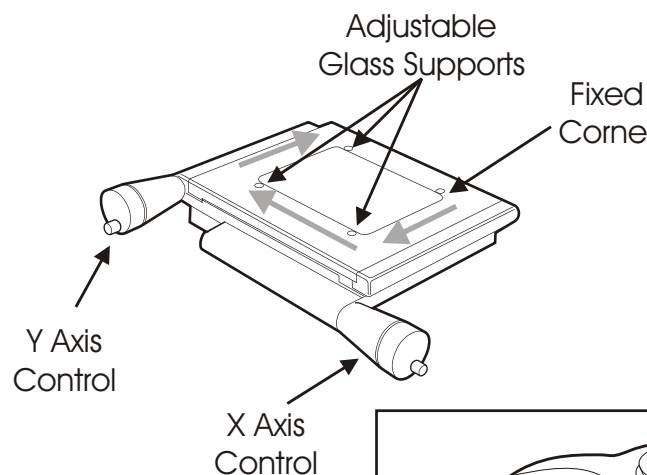
Use the X and Y Axis controls to bring the rear right-hand corner of the Stage Glass (Fixed Corner) into view.

Use the Fine 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.

## STAGE GLASS LEVELLING



## EPI/LENS CONTROLS





**NOTE:**

*The crosshair graticules are factory set and should not need routine adjustment.*

Depress the securing clip at the base of the front cover and lift the cover off.

**NOTE:**

*The left-hand graticule is presented to the right-hand eye.*

To focus and centralize each graticule, loosen the appropriate retaining knob and move the graticule up or down for 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. Closing one eye, locate the crossline on the corner of the gauge (see inset right) by unlocking and adjusting the grubscrews. Once the image is located, lock the grubscrews with the locking nuts.

Repeat this procedure with the other eye. Make the adjustment so that the Graticules overlay each other.

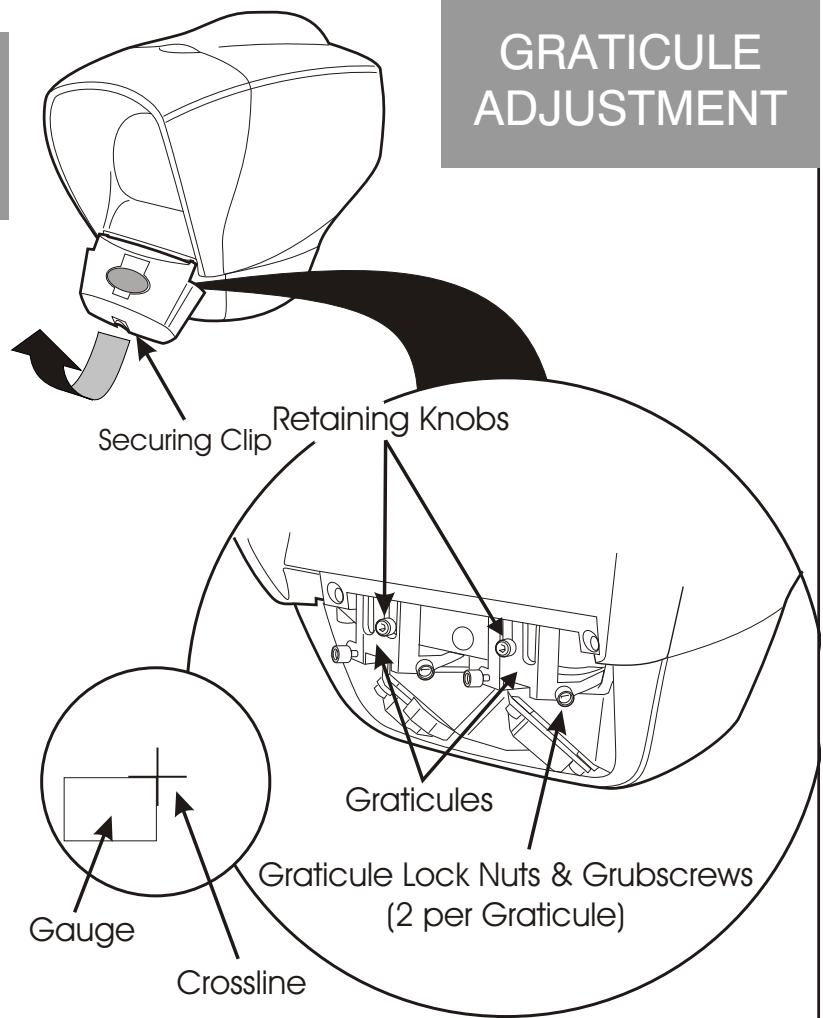
**NOTE:**

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

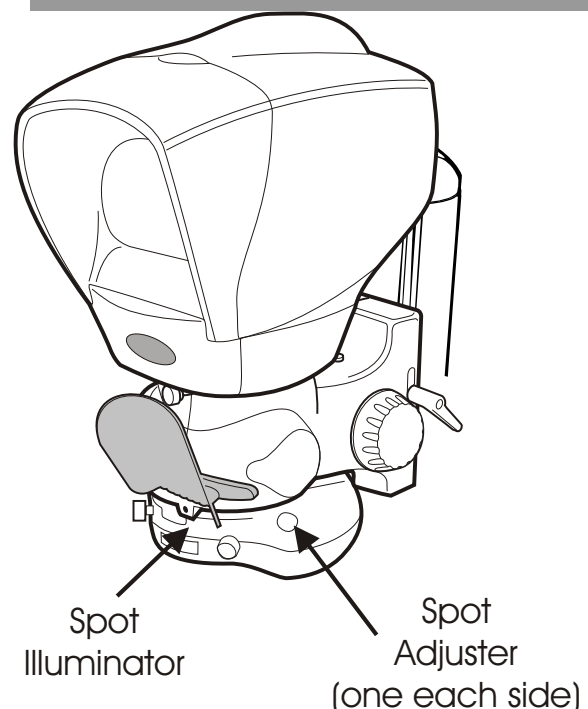
With the unit on, cover one spotlight and adjust the other for maximum light on the subject.

Repeat the procedure for the other spotlight.

## GRATICULE ADJUSTMENT



## SPOT ADJUSTMENT



To achieve the optimum results from your Kestrel Measuring System the illumination and optics need to be adjusted to provide the best possible image to the operator. Certain lighting options are better for some applications than others.

Illumination and focus should be adjusted until the image is clear and bright, with good contrast. Maximum contrast gives the best image resolution and allows for the highest level of accuracy and repeatability.

Contact your nearest Vision Engineering branch or distributor if you require further advice.

## Objective Lens

### Iris Control

Each objective lens has an adjustable iris which restricts the aperture of the lens. By rotating the control ring on the bottom of the objective lens, the iris opens and closes. Adjusting the objective lens aperture changes the amount of light passing back through the lens. This has the effect of slightly increasing or decreasing the depth of field. This feature is useful for subjects where greater surface definition is required.

### Magnification Table

Part No.	Objective Magnification	Working Distance	Field of View
K-007	1x	81mm	14.2mm
K-008	2x	81mm	7.1mm
K-009	5x	61mm	2.84mm

## Illumination Options

### Spotlight

- For the illumination of relatively reflective surfaces.
- Used with lower magnification objective lenses.
- Can be used with substage and episcopic (Epi) illumination.

With the unit on, cover one spotlight and adjust the other for maximum light on the subject. Repeat the procedure for the other spotlight.

The two spots should be focussed on the subject being measured to maximise image contrast. Light intensity can be adjusted by rotating the thumbwheel on the base of the Kestrel stand.

### Ringlight

- To illuminate optically difficult surfaces/surface features.
- For use with higher magnification objective lenses.
- The six point cold light source fibre optic gives a shadow free image.
- Can be used with Episcopic and Substage illumination.
- Adjust light intensity by rotating dial control on light power supply unit.

### Episcopic

- Through the lens illumination for measuring deep surface features, holes and blind bores.
- The light follows the optical path through the objective lens.
- Adjust surface lighting to suit the component by using the lens aperture adjuster and the beam split mirror.
- Adjust light intensity by rotating the dial control on the light power supply unit.
- Adjust depth of field of objective lens with iris control thumbwheel (a smaller iris increases the depth of field).
- Change image contrast by fully engaging the beam split mirror control lever.

## **Substage**

- Understage illumination used only for the accurate measurement of through holes, profiles and edge features for example.
- Adjust intensity by rotating thumbwheel on Kestrel base.
- Can be used with spotlight, ringlight and Epi illumination systems.

### **Substage Aperture Stops**

- Optional accessory for the substage illumination.
- Focus light over a smaller area and primarily used for focussing light on the edge of round components when looking over the radius.
- Component edge can be clearly defined using the aperture stop.
- Available aperture stops - K-024 for x1 objective lens, K-025 for x2 objective lens and K-026 for x5 objective lens.
- Aperture stops screw into substage condenser lens and can be used with any filters.

## **Taking a Measurement**

Select the correct lens for the component being measured based on size of component and field of view (see magnification table). Focus the head on the feature to be measured by adjusting the head and focus assembly on the stand, firstly with the height adjustment control. Do this by undoing the locking lever on the focus assembly side and moving the whole assembly up or down the stand dovetail. Fine focus is achieved by rotating the focus control wheel on either side of the focus assembly.

A measurement is made by moving the subject on the stage under the cross-line graticule in the viewing head field of view. Distances moved and features created are accurately measured by glass scale encoders moving in X and Y at a resolution of 1 $\mu$ m. These X and Y measurements are then translated into useable data by the QC200 microprocessor.

- Lines can be measured by aligning the cross-line at a minimum of two points.
- Circles can be measured by aligning the cross-hair at a minimum of three points on the circle's circumference.
- A point is located by aligning the cross-hair on a single point.
- Further details on making measurements can be found in the QC200 microprocessor user guide.

The accuracy of stage movement is achieved by the application of Non Linear Error Correction (NLEC) which compensates for any mechanical stage errors across the whole useable stage area. A unique NLEC calibration data file is stored in the QC200 relating to the stage being used.

## **Good Working Practices**

When taking points on features the point should always be approached in the same fashion e.g. always work towards a point in the X axis first, moving from left to right. Next move towards a point in the Y axis, moving from top to bottom. This procedure will increase repeatability.

If looking to measure the form of a feature, it is best to take at least eight points to achieve the most repeatable result.

To achieve the very best from your Kestrel non-contact measuring system, you should carry out regular, routine maintenance as well as undertaking a schedule of servicing and calibration (see service & calibration record page)

## ***Routine Maintenance (see pages 15, 16)***

- The viewing screen should be periodically cleaned, using a non-abrasive optical cloth
- The outside of the instrument should be wiped down to remove any dirt and dust
- Illuminator air vents should be inspected and kept clear of any dust / debris
- The instrument and accessories should be checked for loose or damaged components.

## ***Consumable & Replacement Parts:***

Item	Specification	Part Number
Substage & spot lamp bulbs	20W, 12V x4	C-101
Ring light bulb	150W, 21V x1	C-102
Stage glass	150mm x 100mm	K-018
Anti-glare shield	Hinged glare shield	C-126
Substage Fuse	800mA quick blow fuse	FUS-0255

## ***Environmental Considerations***

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

- Position the Kestrel on a firm, rigid table
- Avoid locating the instrument near to any source of vibration
- Ensure Illuminator power supplies have sufficient ventilation
- Do not position the instrument close to a radiator or similar heating system
- Do not position the instrument in direct sunlight, or where bright reflections will prevent a comfortable viewing position.

Clean the viewing screen periodically with optical cloth.

## GENERAL MAINTENANCE POINTS

If, after cleaning the viewing lens, the picture quality is below standard, remove and clean the graticules.

If the graticules require adjustment after they have been cleaned, see page 11.

### Changing the Sub-Stage Fuse:

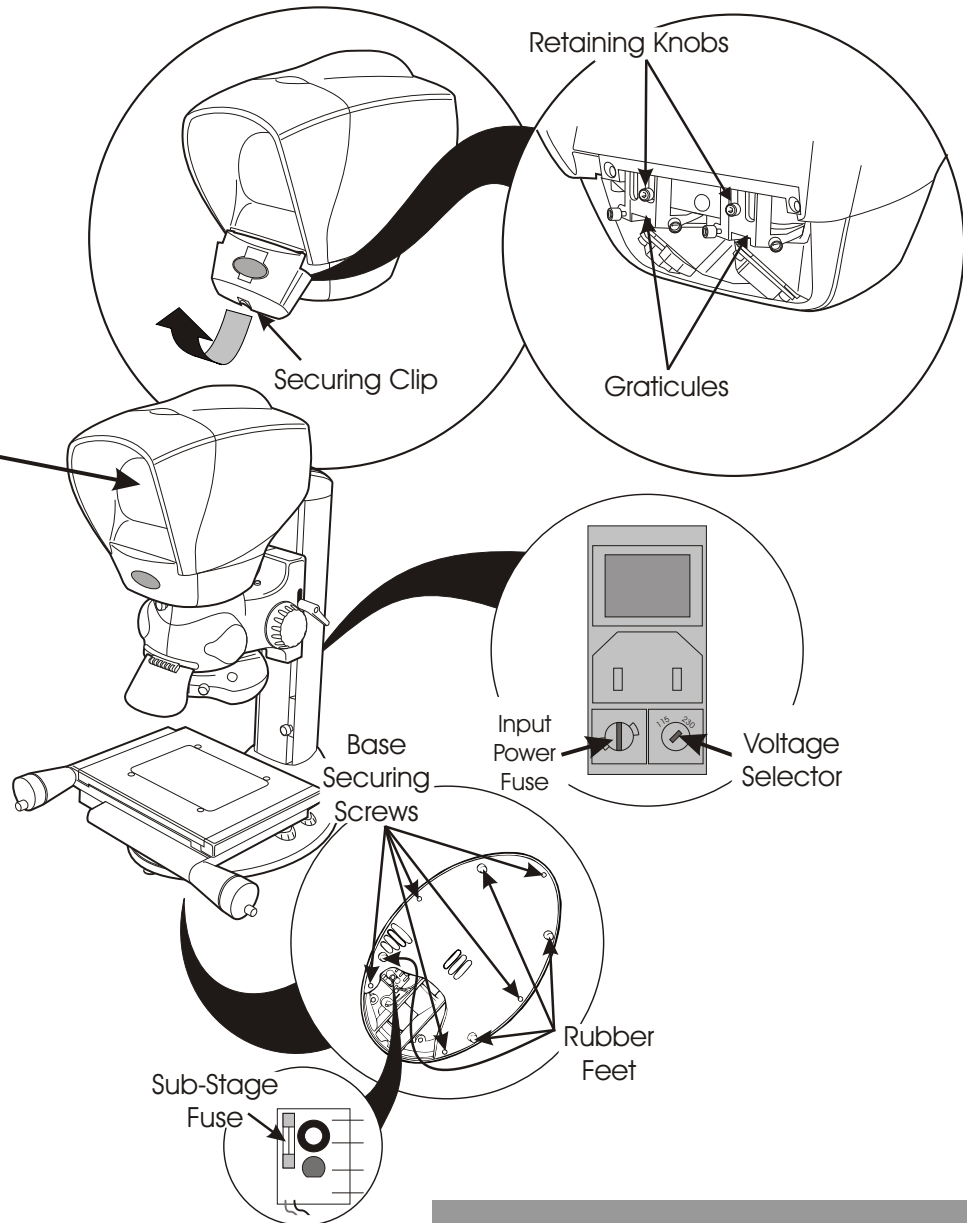
Disconnect the unit from the mains supply.

Remove the 4 rubber feet from the base (push fit).

Remove the 5 base securing screws.

Replace the fuse with an 800mA quick blow type.

**NOTE:**  
When the base is replaced, ensure the heat slots line up with the heatsink and substage bulb.



**NOTE:**  
Ensure the Voltage Selector is turned to the correct setting. For Japan and some Far Eastern markets the voltage selector is marked 100 - 110V.

## ILLUMINATOR LAMP CHANGING

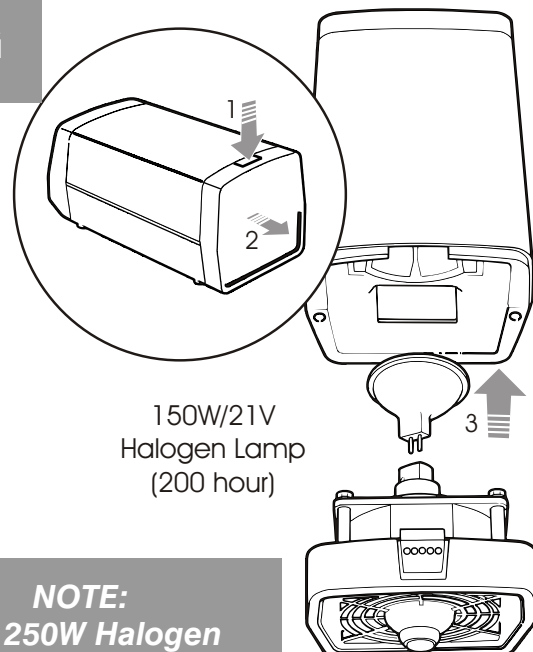
**NOTE:**  
*ENSURE THE ILLUMINATOR IS NOT HOT.*

Press down the bulb/fan assembly release button (see 1 above).

Lift out the bulb/fan assembly (see 2 above).

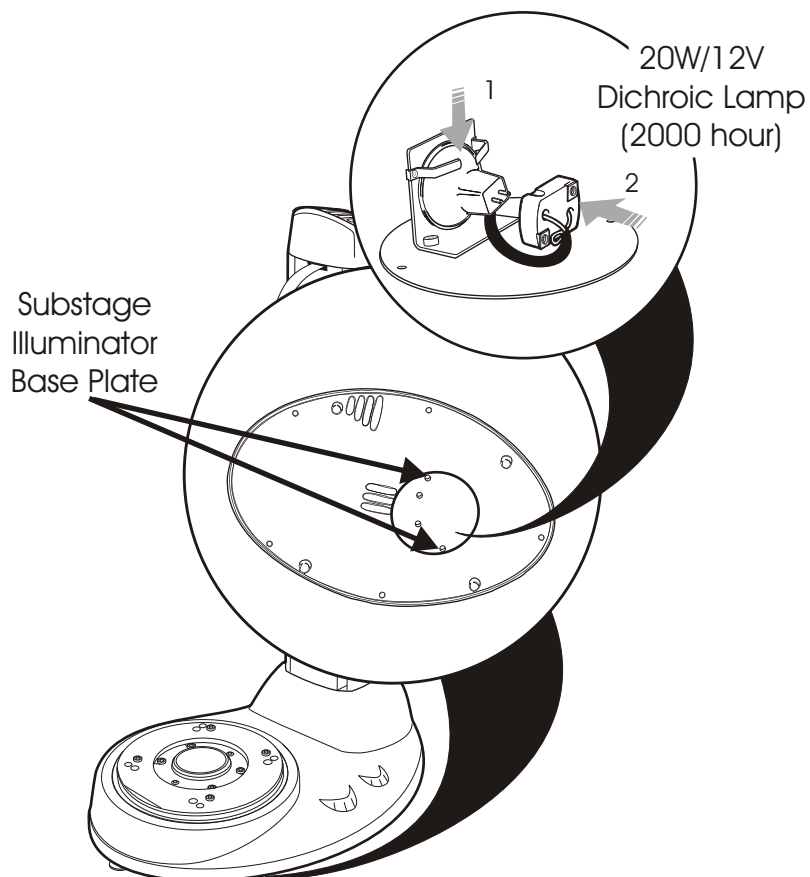
Disconnect the lamp as shown in 3 above.

When relocating a lamp, ensure it is fully pushed into the lamp holder.



**NOTE:**  
*The 250W Halogen lamp version (60 hours) has the same lamp change procedure*

## SUB-STAGE LAMP CHANGING



Disconnect the unit from the mains supply.

Carefully turn the stand on its side.

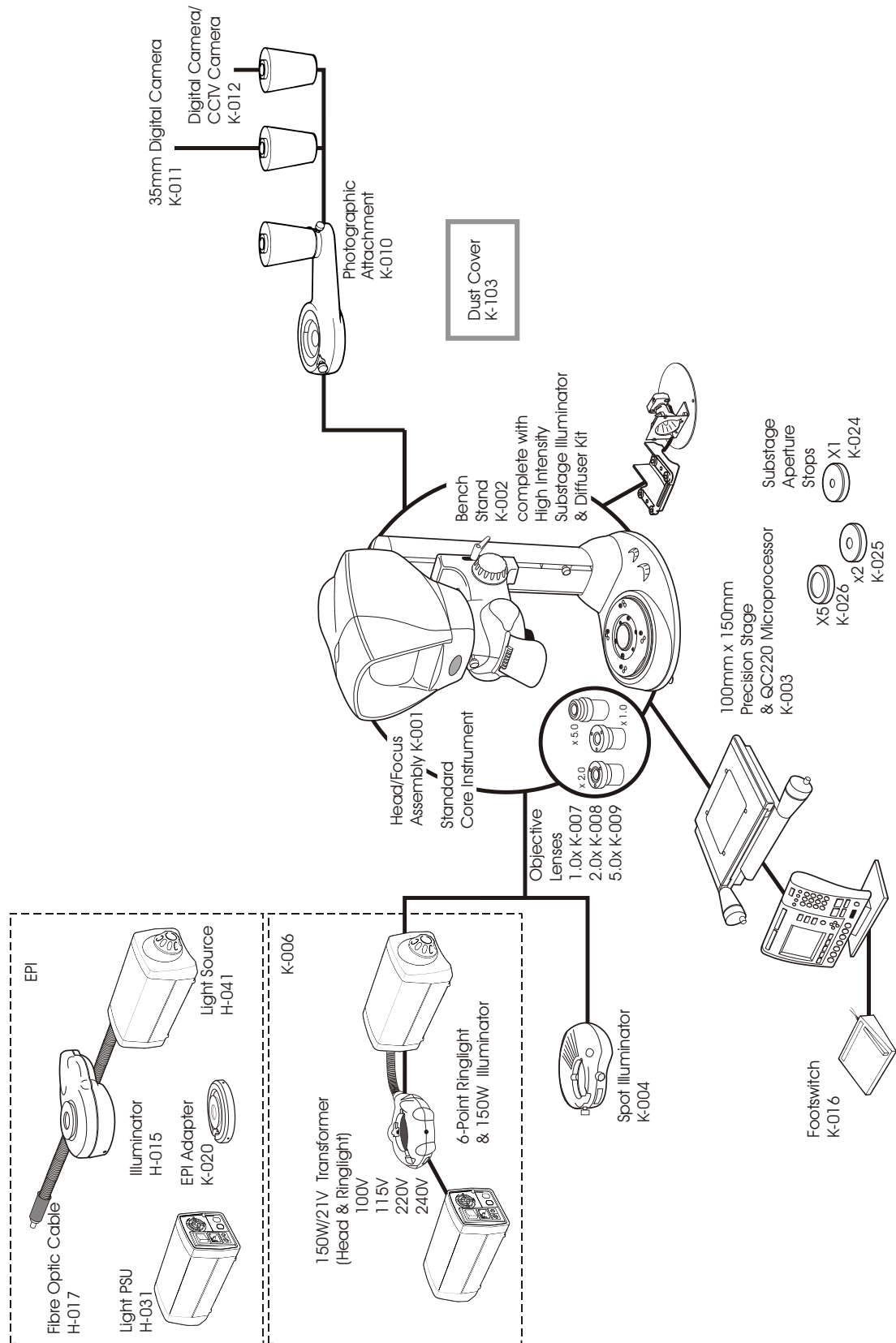
Remove the two outside bolts from the Substage Illuminator base plate and remove it, complete with Substage Illuminator.

Disconnect and remove the sub-stage illuminator bulb. Fit the new bulb (see 1 and 2 left) and replace the illuminator.

**FAMILY TREE**

# Kestrel 2 Axis Non-contact Measurement System

FOR INSPECTION & GENERAL MICROSCOPE APPLICATIONS (last update Nov 05)





A wide range of optional accessories can be used with the Kestrel measuring system, further expanding on system capability. For further details, either visit the website or contact your local Vision Engineering branch / distributor.

## Ring Light

A 150W, 6 point fibre-optic ring light unit, providing shadow free illumination. The six points of light ensure uniform illumination across the subject. The fibre optic light source is remote, providing cold illumination.

## Episcopic Illumination

Light is projected through the objective lens, following the same path as the image. This is ideal for higher magnification applications where the subject is flat and reflective or where light needs to be projected into a blind hole.

## Camera Arm

The camera arm is fitted between the optical head and the body of the Kestrel instrument. Video or still image can be captured using digital or CCTV video cameras with a 'C' mount threaded adaptor.

## Lens Options

In addition to the standard x2 objective lens, x1 and x5 options are available.

## Anti-glare Hood

Where the Kestrel is used in conditions with high levels of ambient light, an anti-glare hood can be fitted around the viewing head. This hood reduces the level of glare from ambient light that an operator may notice in certain viewing conditions.

## Kestrel Foot Switch

For entry of multiple data points, the foot switch connects directly into the QC200 microprocessor.

## Kestrel Fit Software

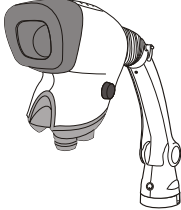

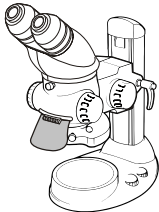
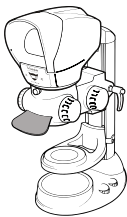
The standard Kestrel configuration allows for accurate gauging and PASS/FAIL results to be generated, Kestrel Fit expands on these capabilities considerably, providing a higher level of reporting and result analysis. Used in conjunction with the Kestrel 2-axis system and QC200 microprocessor, Kestrel Fit allows an operator to rapidly take data points from a measured component and compare them with a CAD data file, providing 'best fit' results and a detailed reporting capability.

Item	Specification	Part Number
Ringlight, Lightsource & PSU	150W fibreoptic ringlight	K-006
Episcopic Illuminator	150W fibreoptic episcopic lamp	K/E/1/2/3
Camera Arm	Camera arm & Digital camera adaptor	K-010 & K-011
Lens options	X1 & X5 Objectives	K-007, K-009
Anti-glare Hood	Shield to reduce ambient light	L-010
Kestrel Foot Switch	Foot switch for data entry	K-016
Kestrel Fit Software	CAD comparison & fitting software	KF-01/02

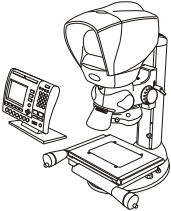


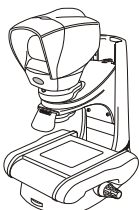


Vision Engineering manufactures a wide range of stereo inspection and non-contact measuring systems. Here is a summary of the products utilising Vision's technology that are available to you.

## Stereo Inspection Systems

Product	Picture	Features	Description
<b>New Mantis</b>		<ul style="list-style-type: none"> <li>• X4 - X20 Magnification</li> <li>• Shadow-free LED cold illumination, both surface and substage</li> <li>• Long working distances, large depth of field</li> </ul>	The New Mantis family is a unique range of optical systems without eyepieces, for intricate tasks requiring superb quality viewing over long periods of time. Available with universal variable boom mount or as a rigid stand mounted option in the low investment Mantis Compact, high performance Mantis Elite and straight-through view Mantis Macro.
<b>Alpha</b>		<ul style="list-style-type: none"> <li>• X2.1 – X160 magnification</li> <li>• 80mm – 2mm field of view</li> <li>• Camera option</li> <li>• Expanded pupil eyepieces</li> </ul>	Expanded pupil eyepiece stereo zoom microscope. Available in boom and rigid stand configuration with a wide range of optional accessories (e.g. lighting, cameras)
<b>Beta</b>		<ul style="list-style-type: none"> <li>• X2.1 – X160 magnification</li> <li>• 77mm – 1.75mm field of view</li> <li>• Camera option</li> <li>• Conventional eyepieces</li> </ul>	Conventional eyepiece stereo zoom microscope. Available in boom and rigid stand configuration with a wide range of optional accessories (e.g. lighting, cameras)
<b>Lynx</b>		<ul style="list-style-type: none"> <li>• X2.1 – X120 magnification</li> <li>• 77mm – 1.75mm field of view</li> <li>• Camera option</li> <li>• Eyepieceless viewing system</li> </ul>	Advanced eyepieceless stereo zoom microscope. Available in boom and rigid stand configuration with a wide range of optional accessories (e.g. lighting, cameras)

## Non-Contact Measuring Systems

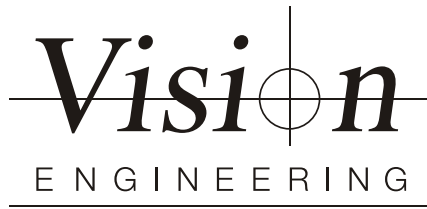
Product	Picture	Features	Description
<b>Kestrel</b>		<ul style="list-style-type: none"> <li>• 150mm x 100mm stage</li> <li>• X10 – X50 mag options</li> <li>• QC200 Microprocessor</li> <li>• Eyepieceless viewing system</li> </ul>	Entry level, 2-axis measuring system. Ideal for shop floor gauging applications.
<b>Hawk Manual</b>		<ul style="list-style-type: none"> <li>• 150mm x 150mm stage</li> <li>• X10 – X1000 mag options</li> <li>• 2 or 3 axis capability</li> <li>• Large stage option</li> <li>• Eyepieceless viewing system</li> </ul>	Advanced manual measuring system, offering increased accuracy and capacity.
<b>Hawk Precision</b>		<ul style="list-style-type: none"> <li>• 200mm x 150mm stage</li> <li>• X10 – X1000 mag options</li> <li>• 2 or 3 axis capability</li> <li>• Eyepieceless viewing system</li> </ul>	High accuracy measuring system for 2 and 3 axis measurement. Operates with QC200 microprocessor or QC5000 PC software.
<b>Hawk Automatic</b>		<ul style="list-style-type: none"> <li>• 200mm x 150mm stage</li> <li>• X10 – X100 mag options</li> <li>• Video Edge Detection</li> <li>• Motorised stage movement</li> <li>• 2 or 3 axis capability</li> </ul>	Automated measuring system combining optical viewing head with PC based Video Edge Detection. 2 and 3 axis motorised stage movement controlled by QC5000 PC software.

Kestrel Serial Number \_\_\_\_\_

Stage Serial Number \_\_\_\_\_

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 lamps and fuses carry no warranty.

This warranty does not cover damage caused 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 instruction manual or any other 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.

Vision Engineering has been manufacturing advanced optical systems since 1958 when the company was founded in Woking, England. Through continual product development, Vision's reputation has been built on innovative design, excellent optical technology and ergonomically advanced products.

Products and support are available world-wide through a network of local branches and an extensive distributor network

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