Vision
ENGINEERING

HAWK

User Guide

2 or 3-Axis Manual Non-Contact Measuring System

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Health & Safety

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).

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ASSEMBLY

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ACCESSORIES & OPTIONS

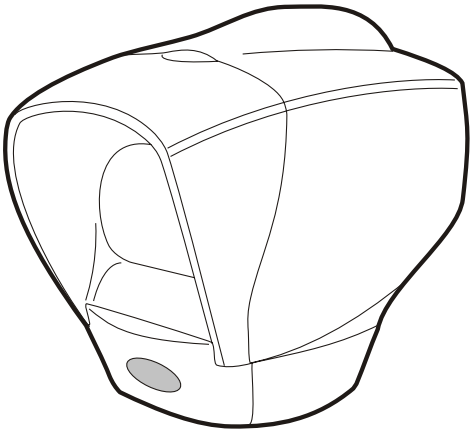
OTHER SOLUTIONS FROM VISION ENGINEERING

SERVICE & CALIBRATION RECORD

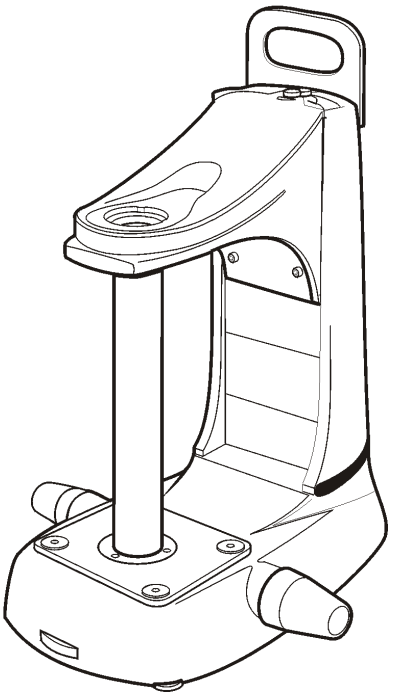
WARRANTY

See packing list to clarify contents of delivery.

Head pack



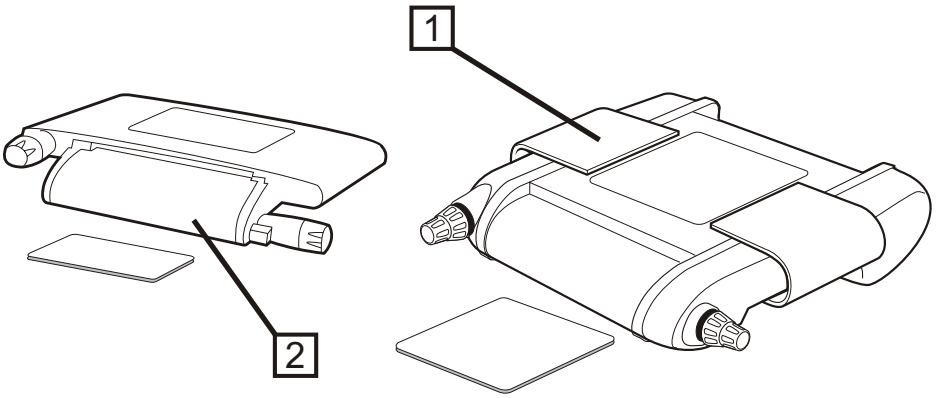
Stand pack



Stage pack

1 200mm x 150mm (8" x 6")

2 150mm x 150mm (6" x 6")

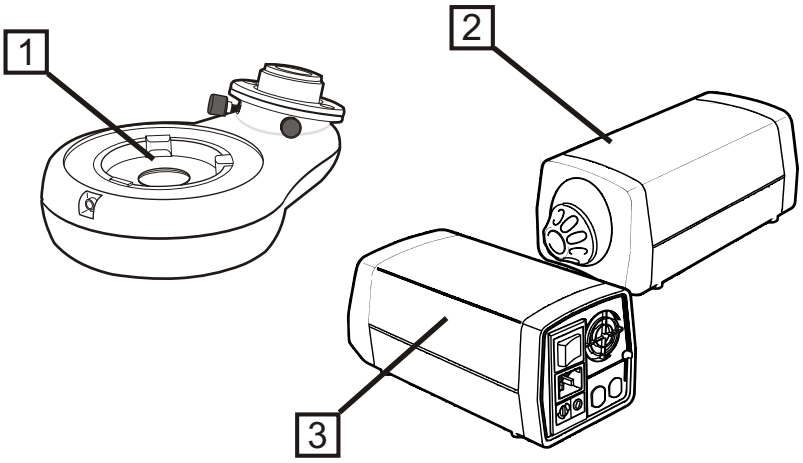


Accessories packs

1 Photographic adaptor

2 Illuminator

3 Power supply



Illumination and objectives pack

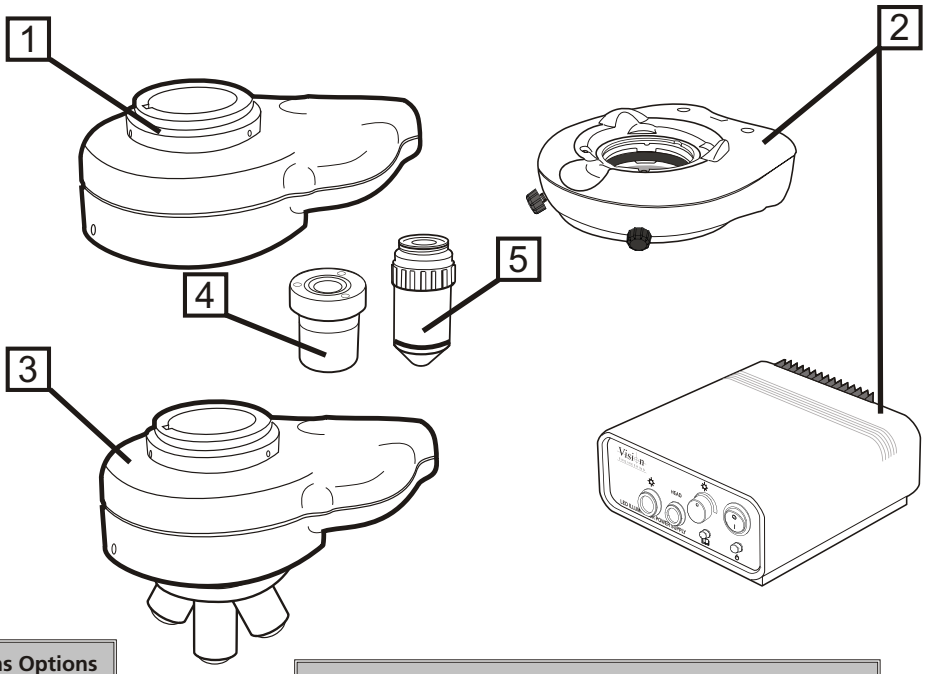
1 Macro EPI

2 Ringlight and Control box

3 Micro EPI/Turret Assembly

4 Macro Lens

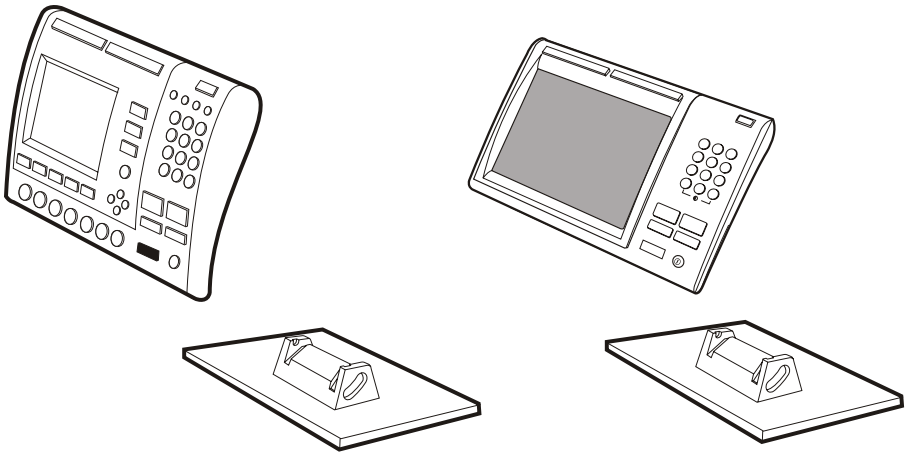
5 Micro Lens



Macro Lens Options
x1
x2
x5
x10

Micro Lens Options		
Micro	Micro LWD	Micro SLWD
x5	x10	x20
x10	x20	x50
x20	x50	
x50	x100	

QC-200/300 microprocessor pack

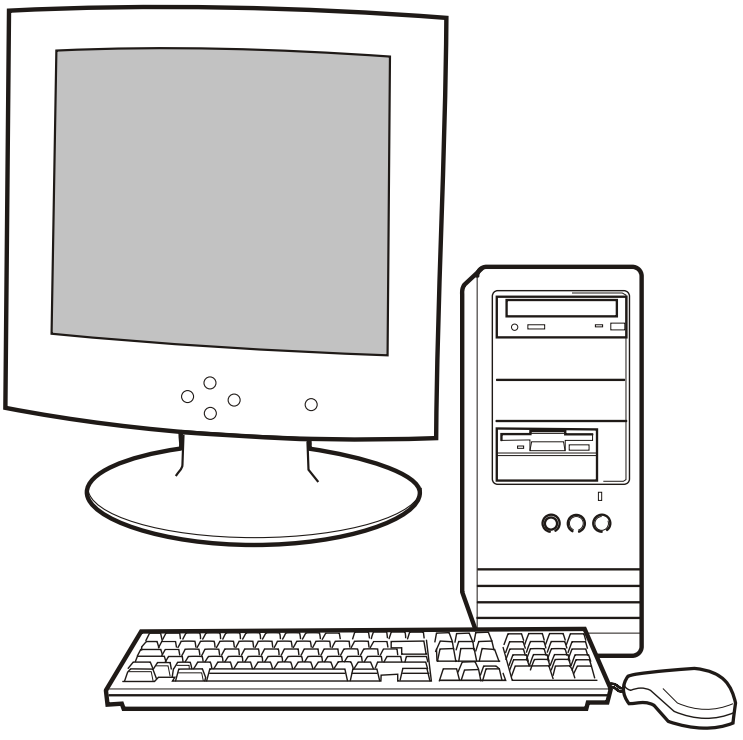


QC-200 items included:
Power lead
Instruction manual
QC Quickie Test Slide

QC-300 items included:
Power lead
Instruction manual
QC Quickie Test Slide

QC-5000 microprocessor pack

QC-5000 items included	
Manual	Optional Manual VED
Instruction Manual	Instruction Manual
Encoder Cable	Encoder Cable
RS232 Comms Cable	RS232 Comms Cable
2 x Power Leads	2 x Power Leads
QC-5000 Software	QC-5000 Software
Windows Software	Windows Software
	Graphics Card (pre-installed)
	Drivers Disc
	Additional Monitor
	S-Video Cable

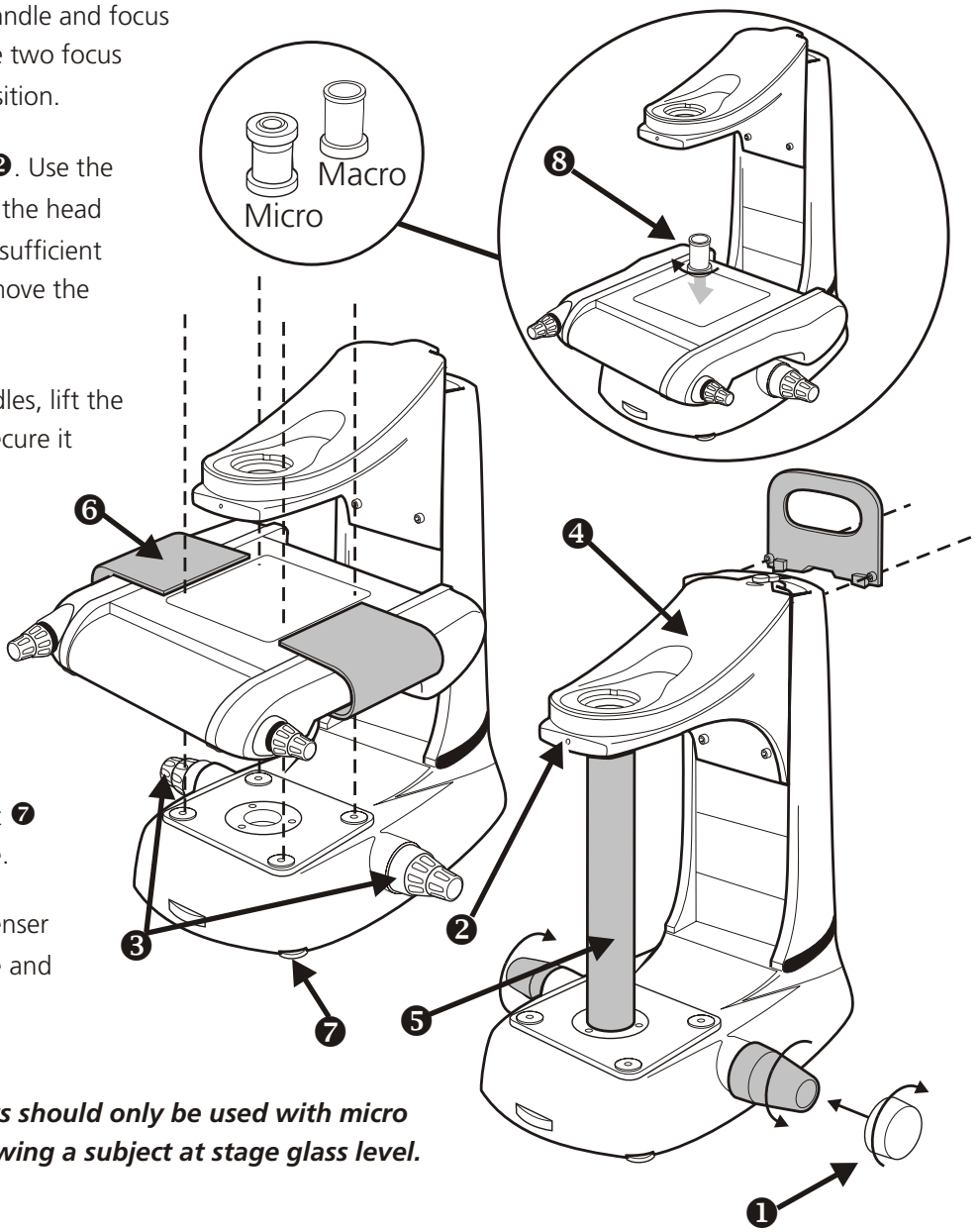


The following paragraphs provide instructions on how to assemble the Hawk Measuring System. In most instances the illustrations are self explanatory; where necessary the illustrations are supported by text.

Stage assembly

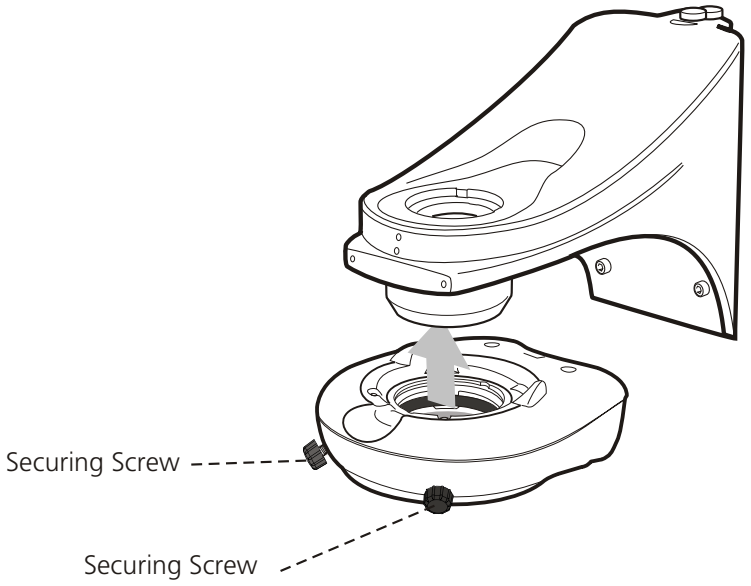
To attach the Stage proceed as follows:

- Use the red transit handle and focus control covers to lift the stand into the required work position.
- Remove the red transit handle and focus control covers. Screw the two focus control collars ❶ into position.
- Remove the grub screw ❷. Use the focus controls ❸ to raise the head platform ❹ until there is sufficient room to unscrew and remove the transit tube ❺.
- Using the red transit handles, lift the stage into position and secure it using the bolts provided with the stand, not the bolts that secure the stage into the transit box.
- Remove the stage transit handles ❻.
- Adjust the stabilizing foot ❼ to support the stand base.
- Screw the required condenser lens ❽ through the stage and into the stand.



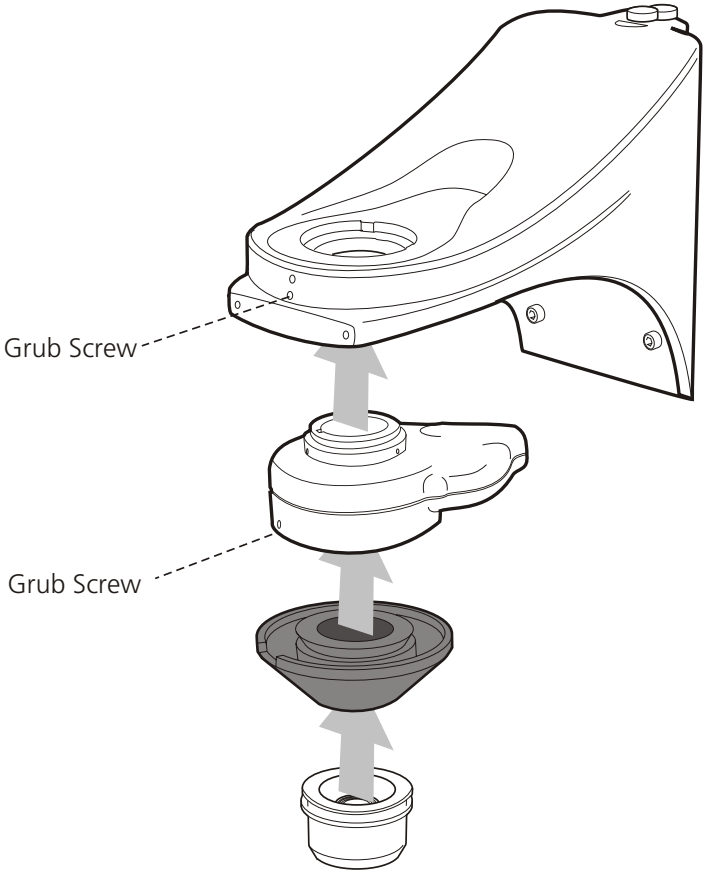
Note: ***Micro condensers should only be used with micro lenses when viewing a subject at stage glass level.***

Ringlight attachment

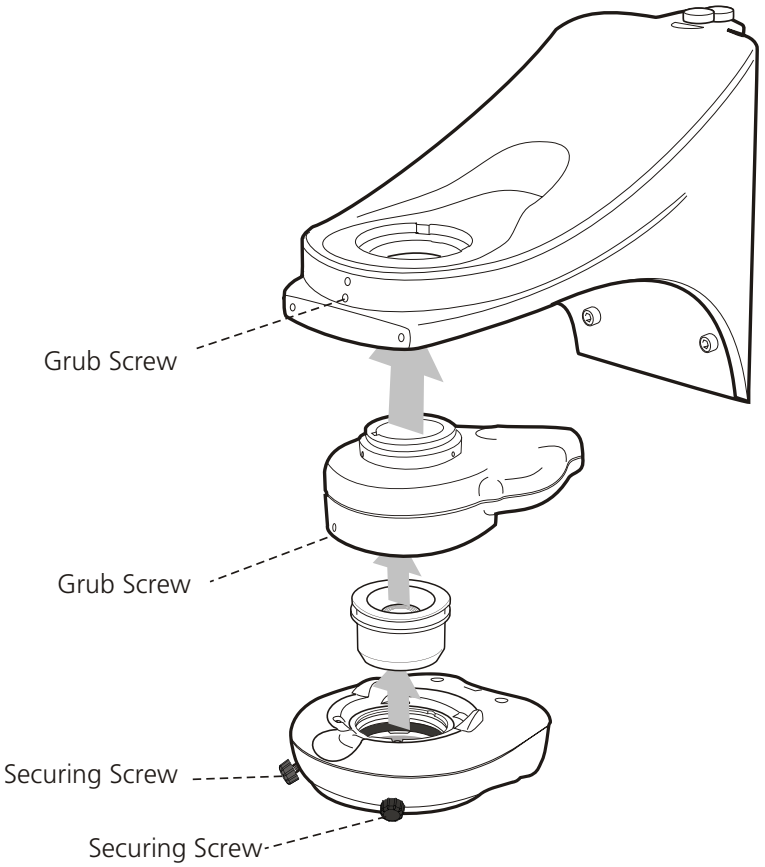


Macro EPI attachment

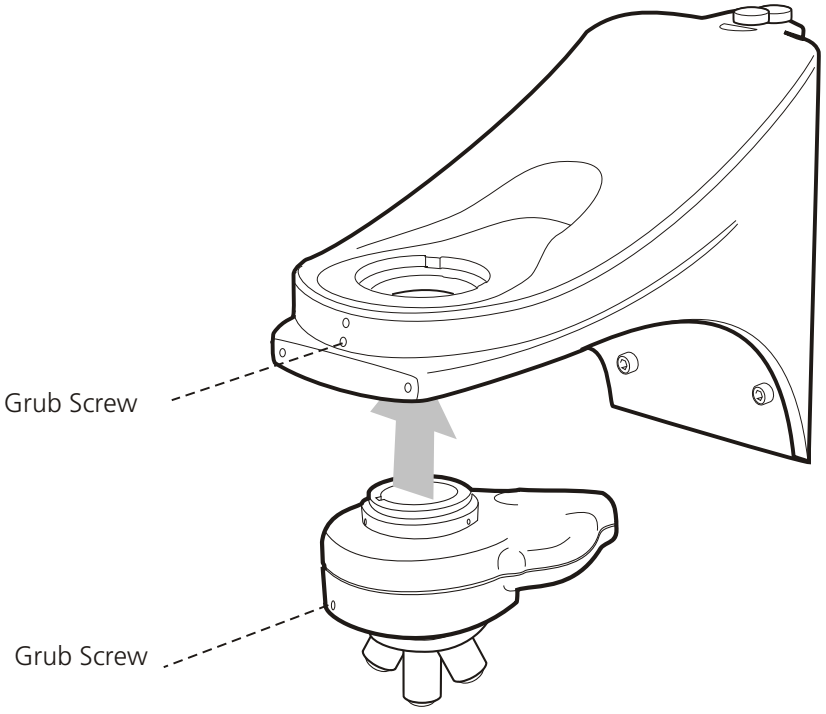
Note: ***The same procedure is used to fit either the Macro EPI (illustrated) or the Micro EPI. The Micro EPI cannot have an Objective Holder or Ringlight fitted.***



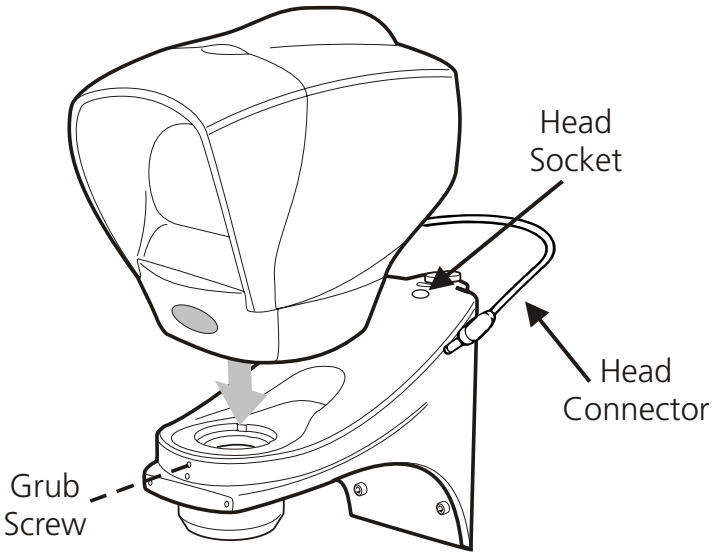
Macro EPI and ringlight attachment



Micro EPI and lens turret attachment

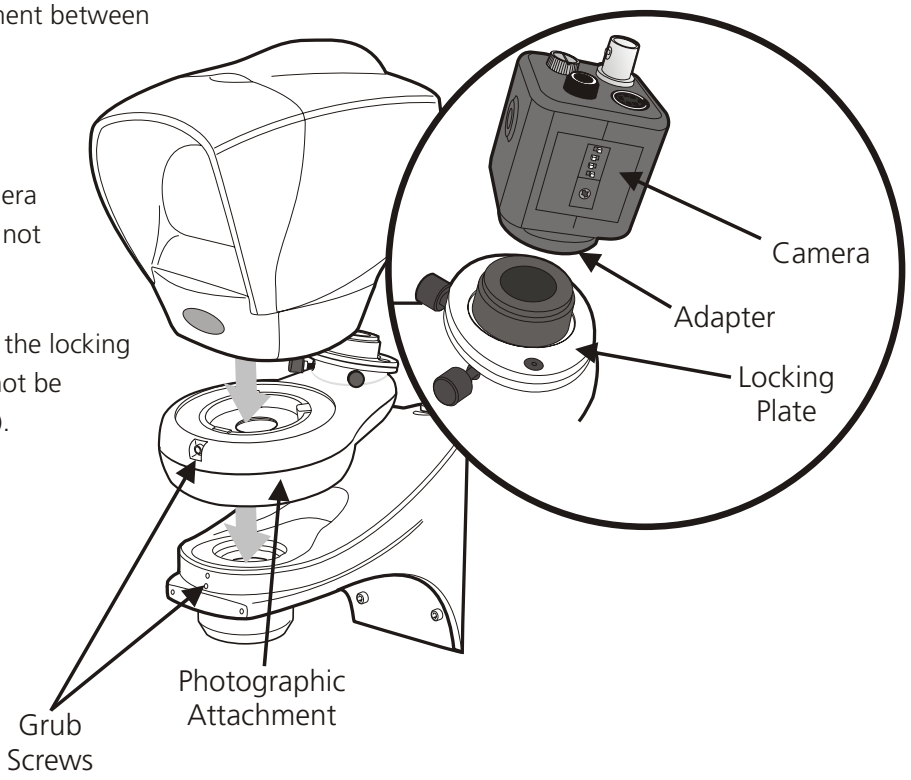


Attaching the head only

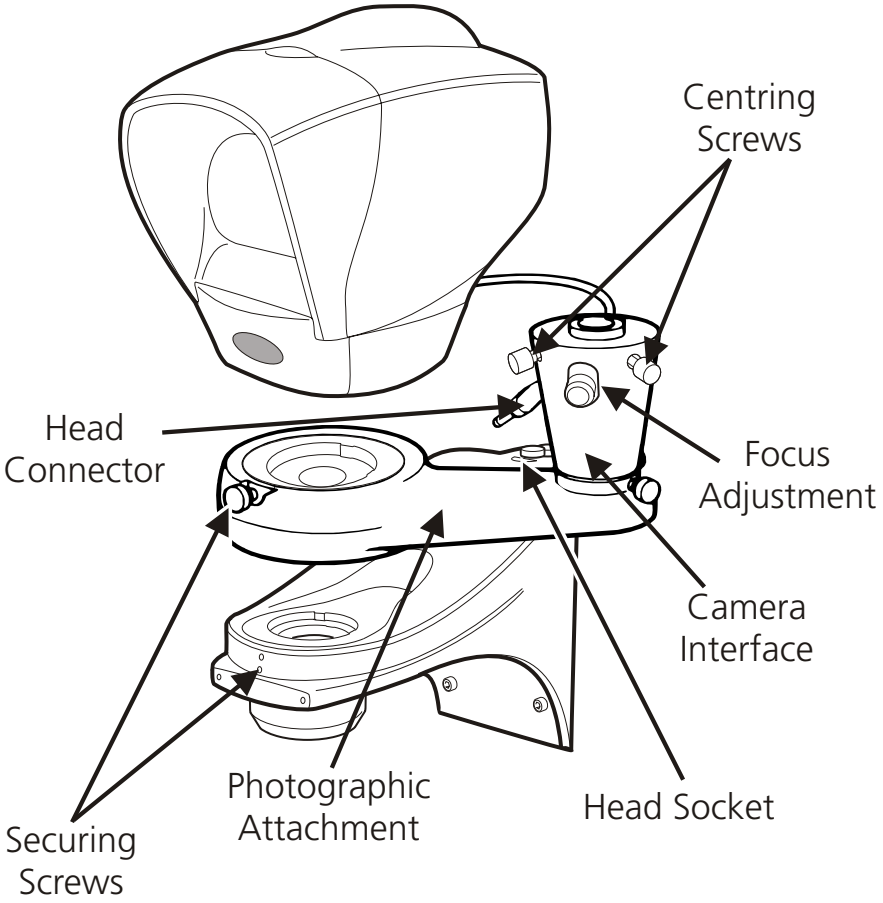


Mounting camera to rear

- Position photographic attachment between the viewing head and its arm.
- Secure with the grub screws.
- Attach the adapter to the camera and tighten 3 x grub screws if not already fitted.
- Locate camera and adapter to the locking plate (the locking plate must not be overtight, but enough to hold).

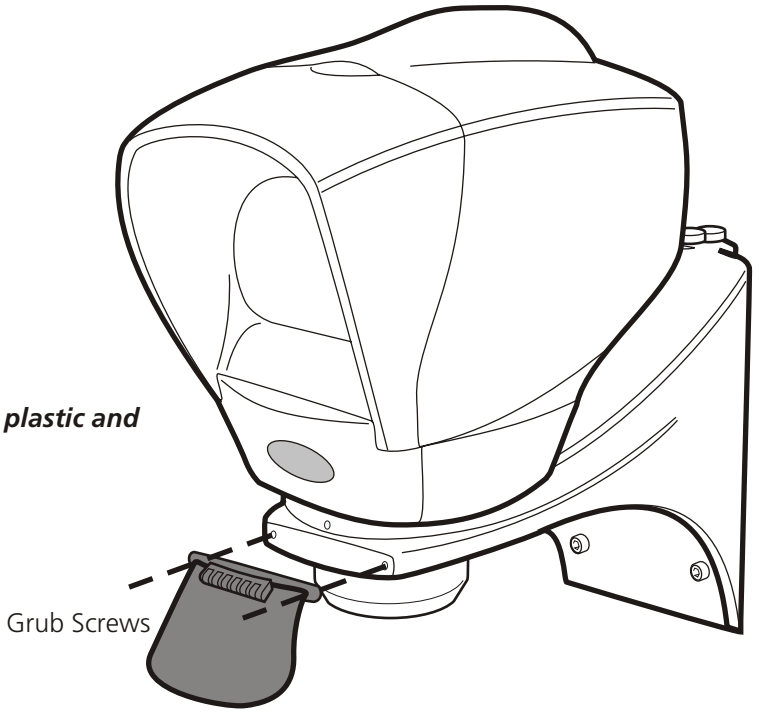


Mounting camera to side for image capture



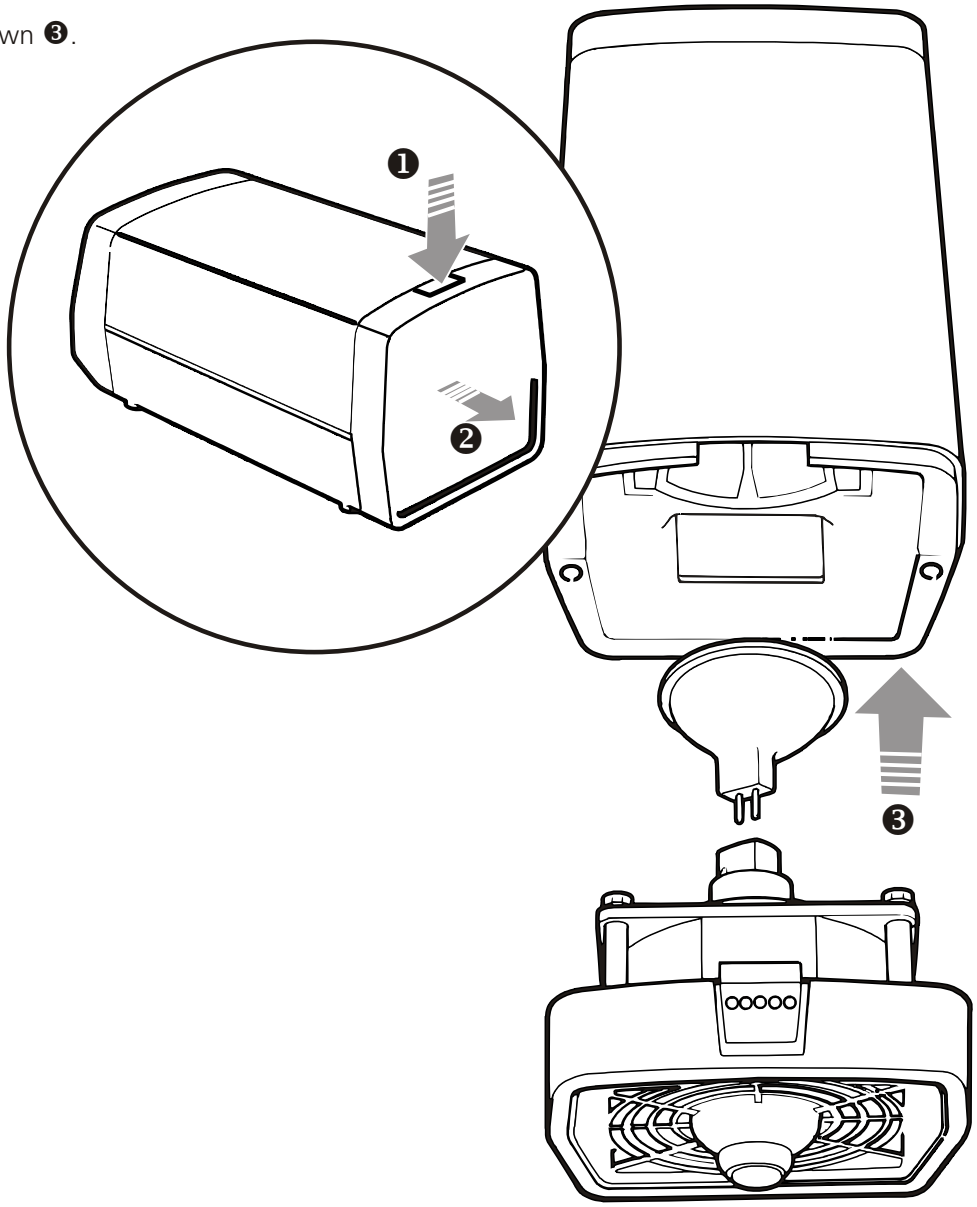
Attaching the anti-glare shield

CAUTION: The Anti-Glare Shield is made of plastic and must not be over tightened.



Inserting the illuminator lamp

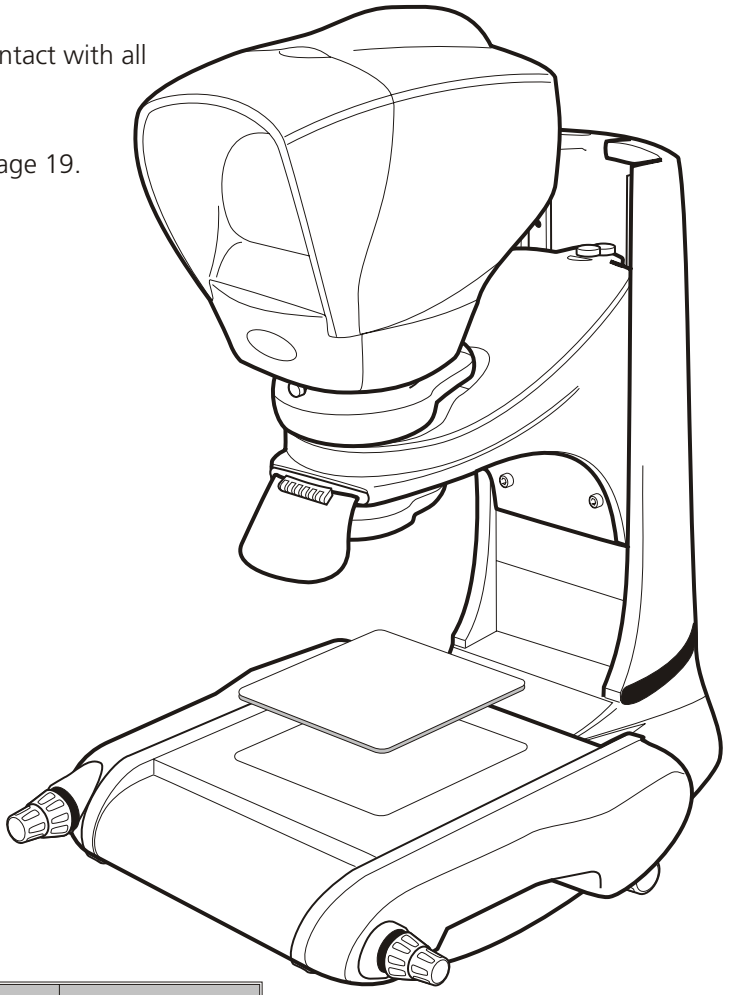
- Press down the lamp/fan assembly release button ❶.
- Lift out the lamp/fan assembly ❷.
- Insert the lamp as shown ❸.
- Check that it is fully pushed into the lamp holder.



Inserting the stage glass

Note: ***The stage glass must be handled with care to avoid any fingerprint marks.***

- Align the glass with it's bevelled edges against the springs.
- Check that the stage glass is in contact with all four supports.
- To level the stage glass, refer to page 19.



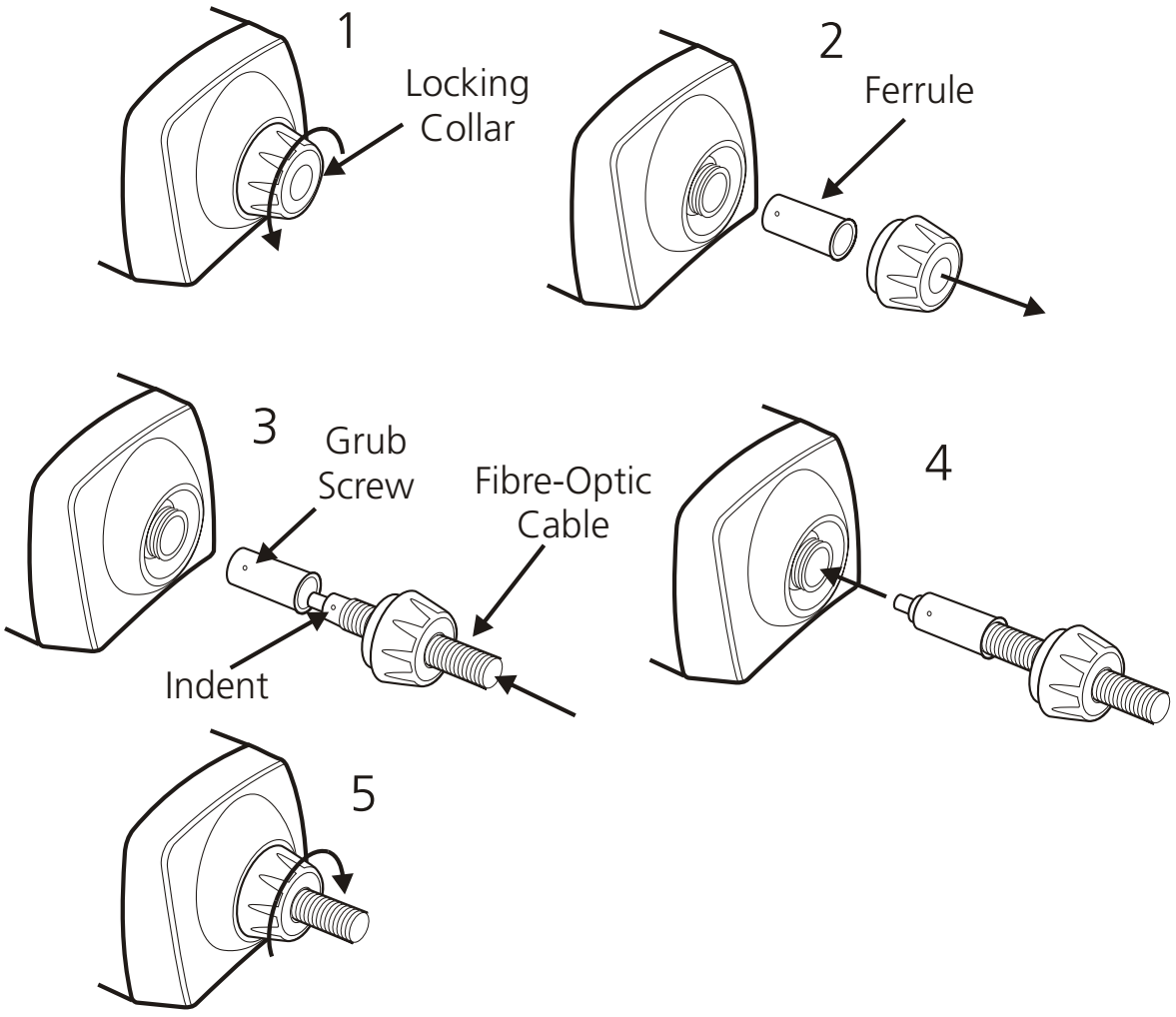
Stage size	Spring location
150 x 150mm	Left & Back
200 x 150mm	Left & Front

Connecting the fibre optic cable to the illuminator

- Unscrew the locking collar.
- Remove the locking collar and ferrule.
- Insert the fibre-optic cable through the locking collar and ferrule. Align the grub screw with the indent on the cable and tighten the screw with the hexagonal/Allen key provided.

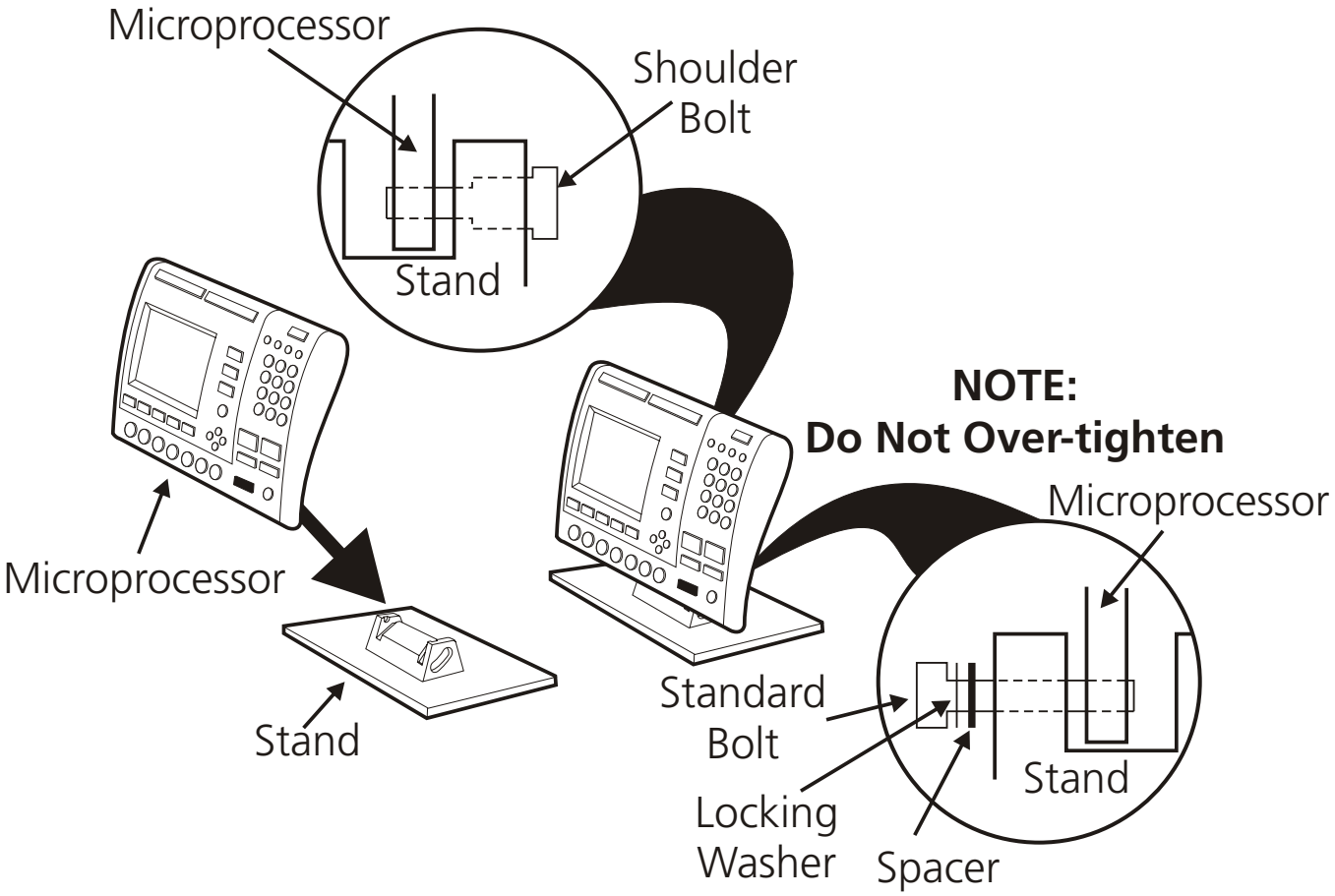
Note: ***The hexagonal/Allen key is taped to the base of the illuminator.***

- Insert the cable and ferrule into the illuminator.
- Tighten the locking collar.



QC-200/QC-300 microprocessor assembly

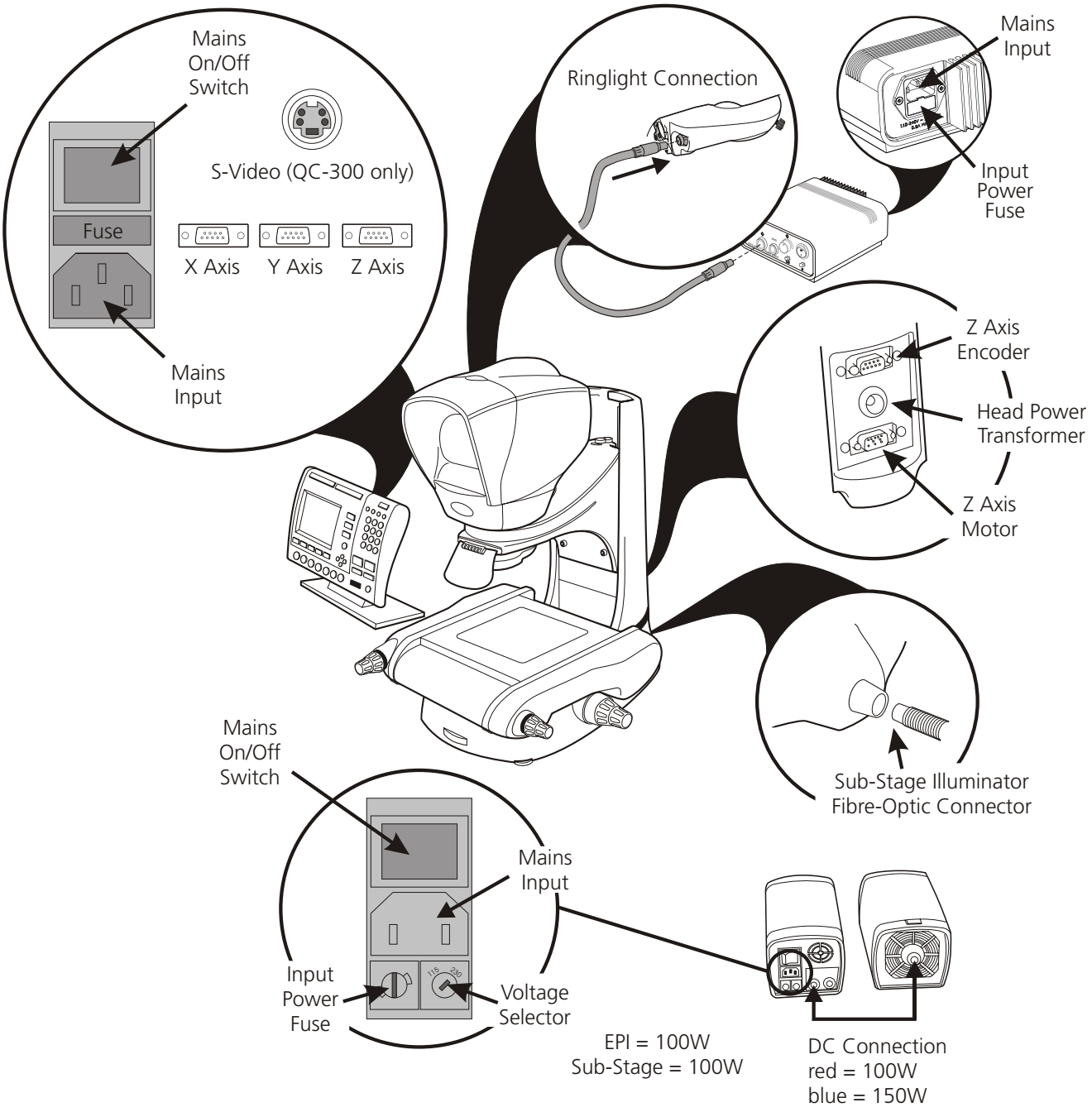
Cable connection points are shown on page 13.



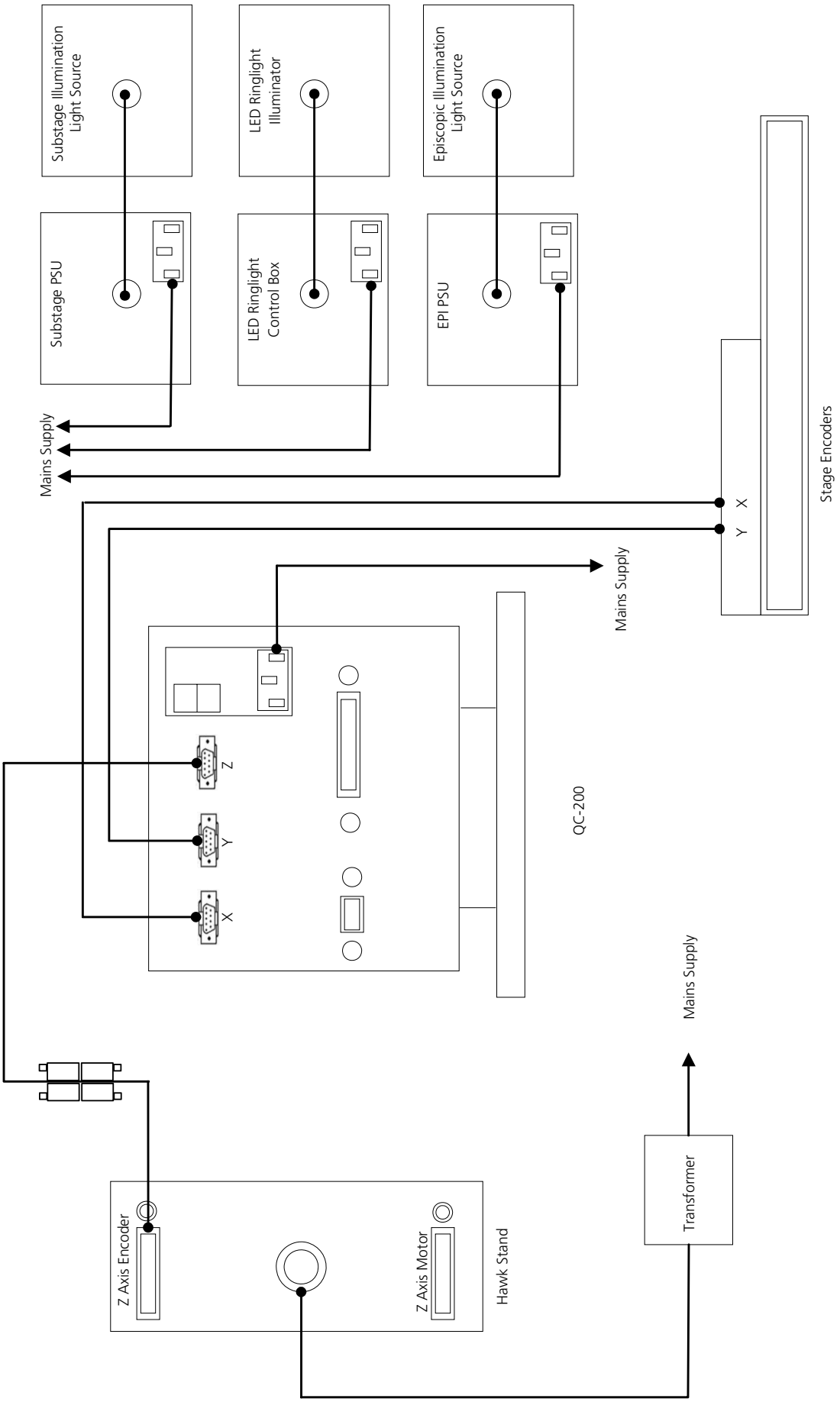
Cable connection points for the manual QC-200/QC-300 system

Refer to pages 14 and 15 for detailed connections.

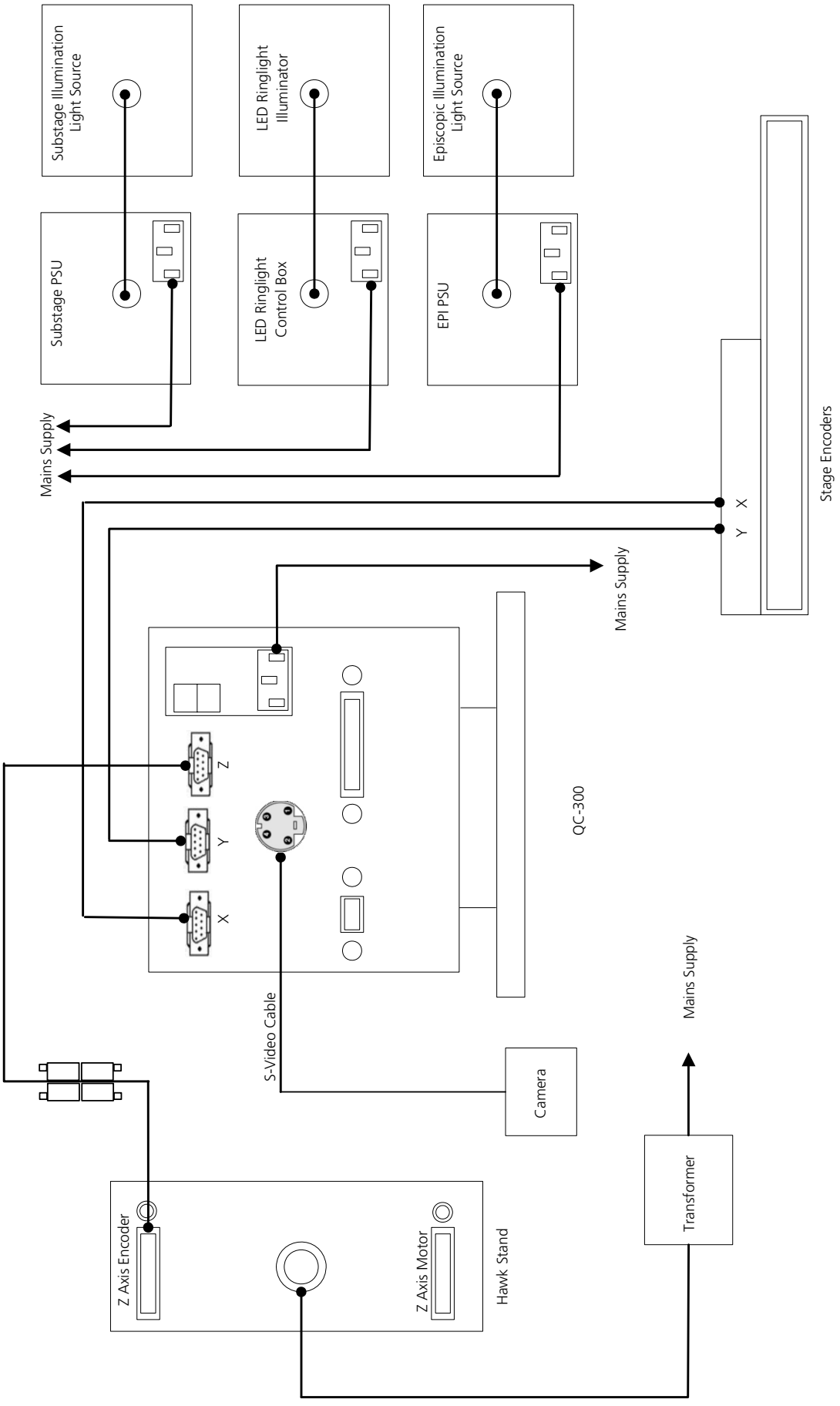
Note: ***Ensure that the voltage selector is turned to the correct setting.***



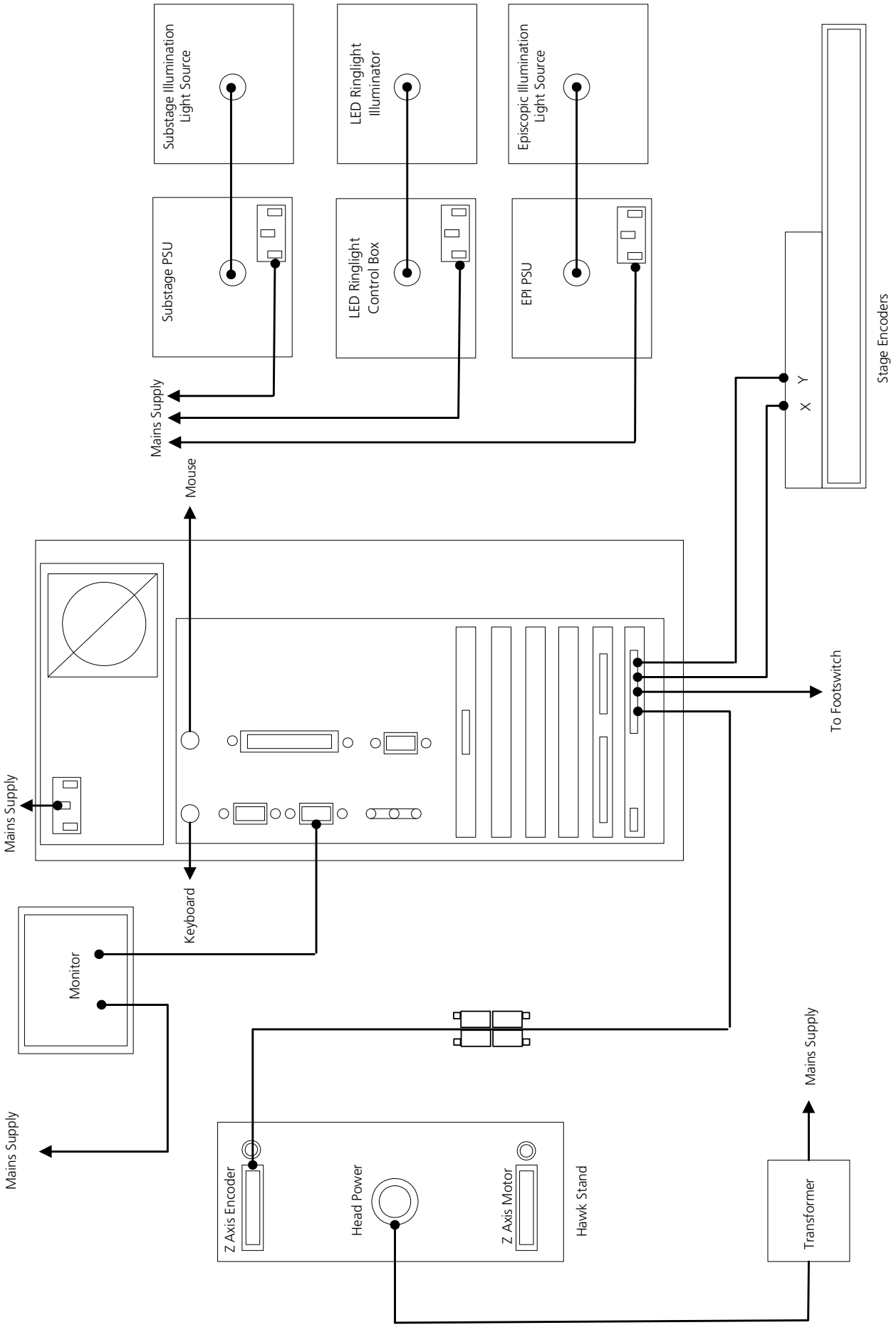
Interconnection diagram for manual Hawk system with QC-200



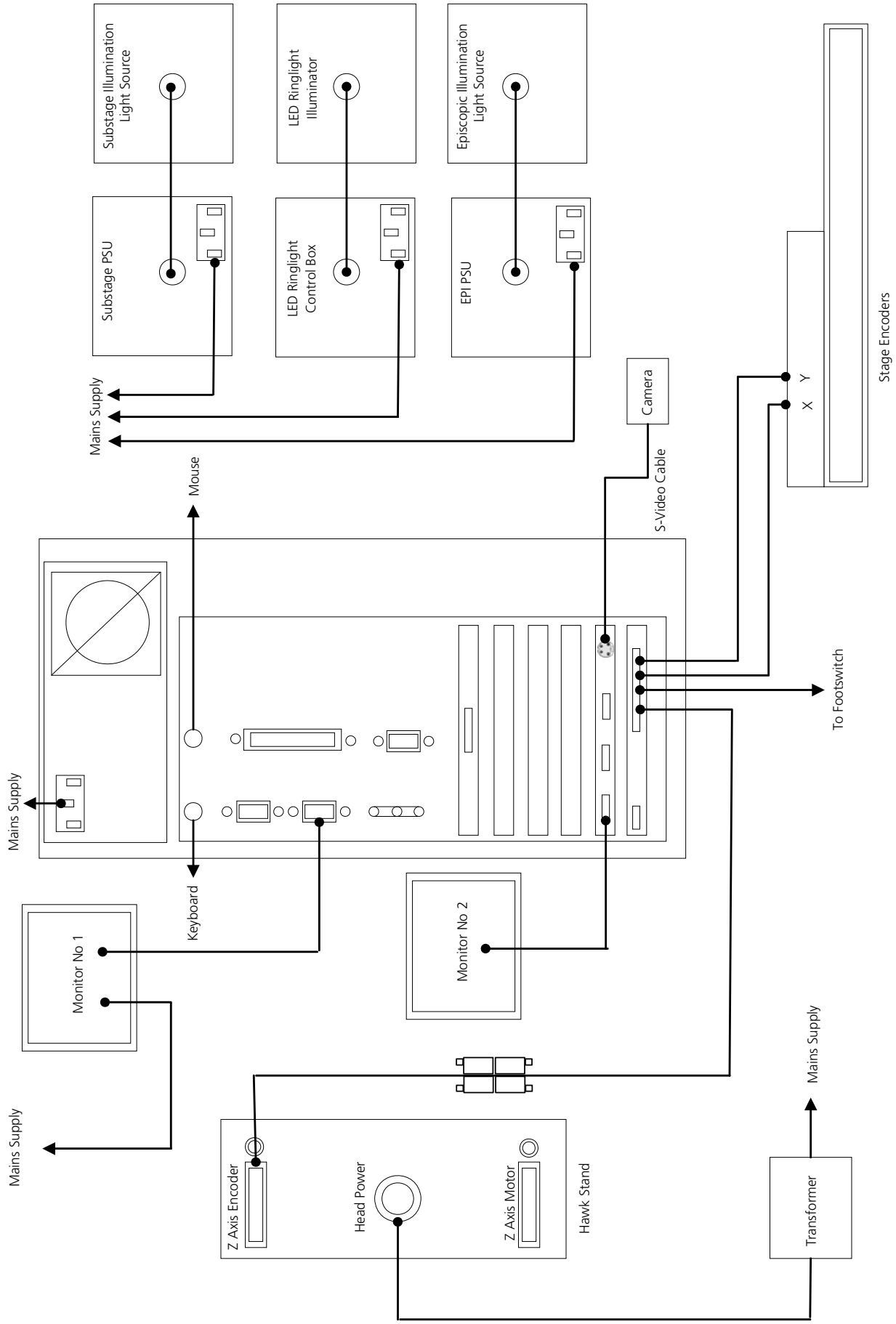
Interconnection diagram for manual Hawk system with QC-300



Interconnection diagram for Hawk system with manual QC-5000



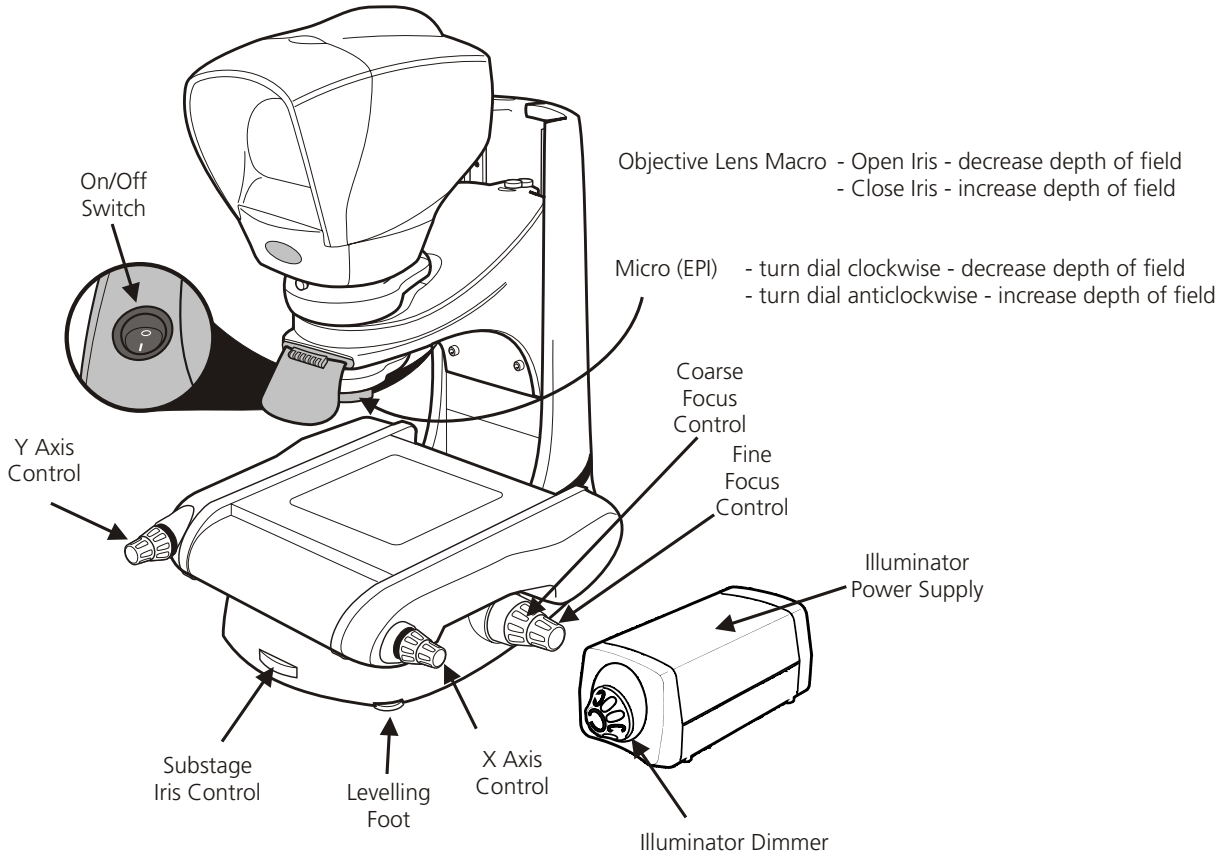
Interconnection diagram for Hawk system with QC-5000 VED



Manual system controls

Turn on the illuminator power supplies and check that the LED at the centre of the head is illuminated.

The manual system controls are identified below.



Align head to stage

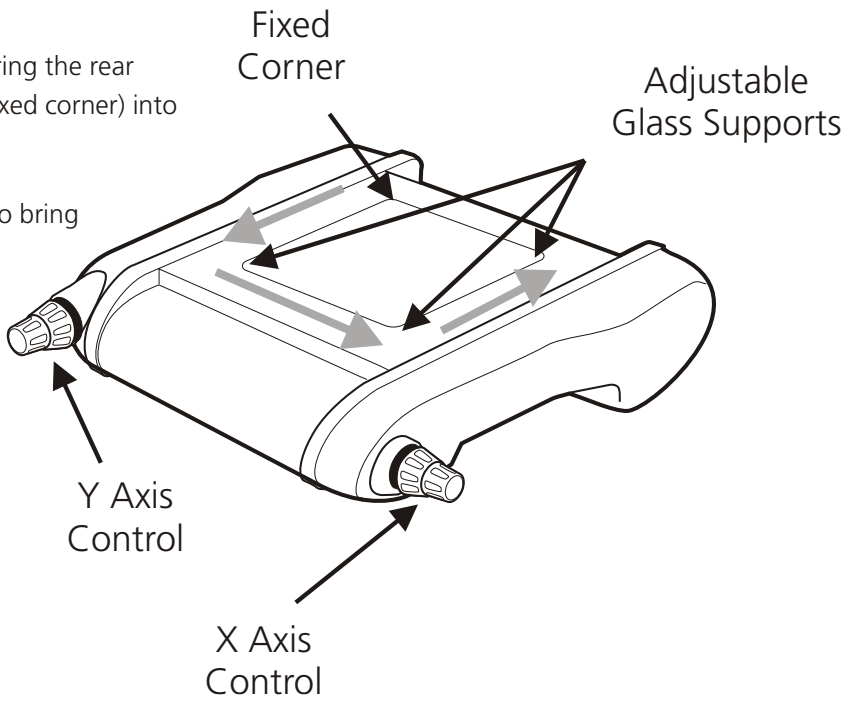
- Ensure that an objective lens is fitted.
- Ensure the head is switched on and then loosen it using an hexagonal/Allen key.
- Align the front edge of the gauge block (or straight edge) with the front edge of the stage glass.
- Rotate the head until the horizontal cross line is parallel with the rear edge of the gauge block (or straight edge).
- Lock the head in position with the hexagonal/allen key.

Stand levelling

- Adjust the levelling foot until the stand is stable.

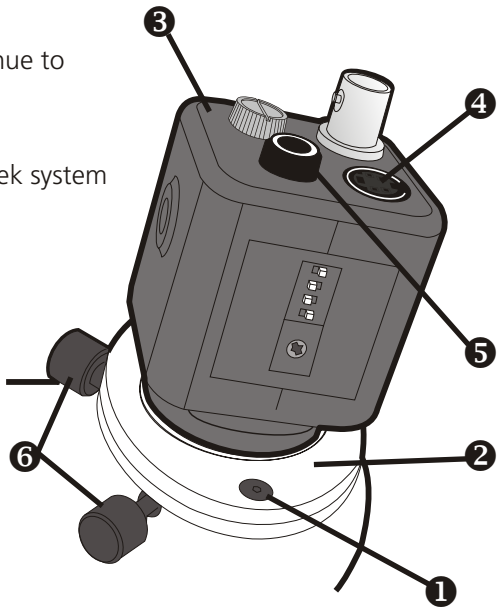
Stage glass levelling

- Adjust the X and Y axis controls to bring the rear left-hand corner of the stage glass (fixed corner) into view.
- Adjust the coarse/fine focus control to bring the glass surface into sharp focus.
- Adjust the X and Y axis controls to bring the front left-hand corner into view.
- Use the relevant adjustable glass support to bring the surface of the glass into sharp focus.
- Repeat the above procedure for the remaining two corners.



Camera Setup

- Loosen hexagonal headed screws ❶ on locking plate ❷ and continue to turn camera ❸ until it is in the correct position.
- Connect the camera from its video connector ❹ to the Quadra-Chek system using S-Video cable.
- Attach power lead to camera's power socket ❺ and switch on.
- Bring the target/slip into focus within the head, as centrally aligned to crosshair as possible.
- Match the view on the monitor with that in the head - move the camera by using the thumbscrews ❻.
- Tighten the hexagonal headed screws on the locking plate to hold camera in position.



To achieve the optimum results from the Hawk 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 the nearest Vision Engineering branch/distributor for further advice.

Objective lens

Iris control

Each Macro 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 slightly increases or decreases the depth of field. This feature is useful for subjects where greater surface definition is required. The same results can be achieved with a Micro objective lens by adjusting the iris wheel in the Episcopic illuminator.

Closing the Substage Iris improves ability to locate an edge on a cylindrical component/raised profile.

Magnification tables

Macro Lenses					
Part No.	**Objective Lens**	**Total Magnification**	**Working Distance**	**Field of View (diameter)**	**Depth of Field**
H-007	x1	10x	84mm	14.2mm	270µm
H-008	x2	20x	81mm	7.1mm	67µm
H-009	x5	50x	61mm	2.8mm	10µm
H-0010	x10	100x	32mm	1.4mm	6µm

Standard Working Distance Micro Lenses					
Part No.	**Objective Lens**	**Total Magnification**	**Working Distance**	**Field of View (diameter)**	**Depth of Field**
H-110	x5	50x	20.0mm	4.4mm	12.22µm
H-100	x10	100x	10.1mm	2.2mm	3.06µm
H-101	x20	200x	3.1mm	1.1mm	1.3µm
H-103	x50	500x	0.66mm	0.44mm	0.3µm

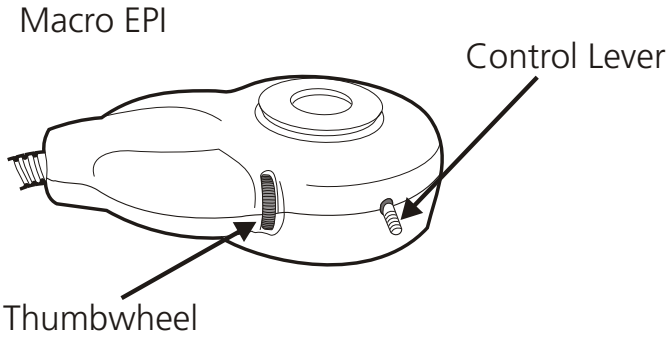
Long Working Distance Micro Lenses					
Part No.	**Objective Lens**	**Total Magnification**	**Working Distance**	**Field of View (diameter)**	**Depth of Field**
H-104	x10	100x	21.0mm	2.2mm	4.4µm
H-105	x20	200x	12.0mm	1.1mm	1.72µm
H-106	x50	500x	10.6mm	0.44mm	1.10µm
H-107	x100	1000x	3.4mm	0.22mm	0.43µm

Super Long Working Distance Micro Lenses					
Part No.	**Objective Lens**	**Total Magnification**	**Working Distance**	**Field of View (diameter)**	**Depth of Field**
H-108	x20	200x	21.0mm	1.1mm	2.24µm
H-109	x50	500x	15.0mm	0.44mm	1.36µm

Episcopic illuminator

The Episcopic illuminator provides through the lens illumination for measuring deep surface features, holes and blind bores. The light follows the optical path through the objective lens. The following adjustment can be made:

- Adjust the surface lighting to suit the component by using the thumbwheel and the beam split mirror.
- Adjust light intensity by rotating the dial control on the light power supply unit.
- Adjust the depth of field of the objective lens by rotating the iris control thumbwheel (a smaller iris increases the depth of field).
- To change the image contrast fully engage the beam split mirror control lever.

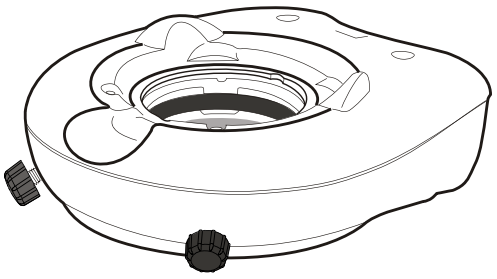


LED Ringlight

The Ringlight illuminator is used as follows:

- To illuminate optically difficult surfaces/surface features.
- For use with Macro objective lenses.
- The Ringlight gives a shadow free image.
- Can be used with Episcopic and Substage illumination.

To adjust the light intensity rotate the dial control on the control box (see page 22).



Control box

Icons

The icons on the front panel of the control box symbolise the following:

On/Off switch

Power on indicator

Illuminator intensity control

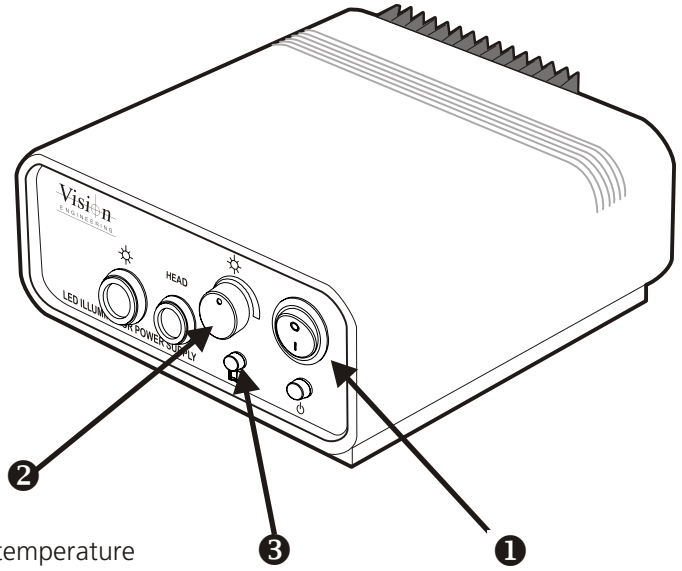
Ringlight connection point

Refer to manual

HEAD Power for viewing unit (boom mount only)

Controls

The LED ringlight, which can be used with substage illumination, provides above stage illumination and is used for illuminating surface features, blind holes, etc.



- Switch the unit on ❶ and adjust intensity by rotating the dimmer control ❷.
- The LED illuminator is provided with a temperature protection system ❸ to ensure long term LED performance is not compromised by overheating.
- If the temperature protection indicator illuminates, the power to the LED's will gradually reduce until the temperature stabilises. If the indicator remains illuminated, remove the illuminator and ensure neither the air inlet around the objective, nor the fan outlet are obstructed.

LED illuminator specification

The LED illuminator unit has an integral power supply with the following specification:

Input voltage: 110 to 240v ~ 50/60Hz 0.9A max

Fuse rating: 110v 1.0A anti-surge
230v 0.5A anti-surge

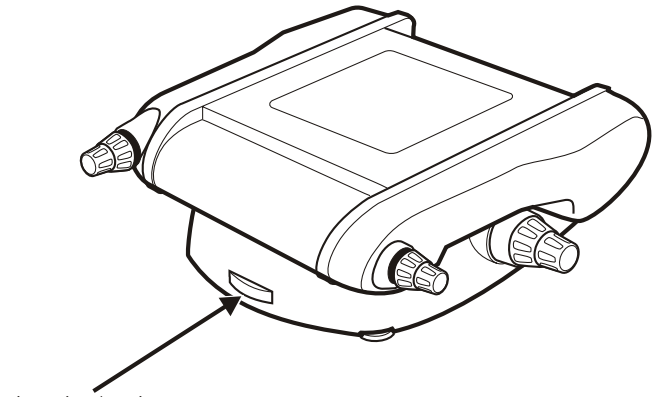
The fuse is located in the IEC mains connector on the rear of the control box (see page 13).

Substage

The Substage illumination is used for the accurate measurement of through holes, profiles and edge features etc. The depth of field is adjusted by rotating the thumbwheel on the Hawk base.

The illumination can be used with spotlight, ringlight and EPI illumination systems.

Adjust light intensity by rotating the dial control on the illumination power supply unit.



Taking a measurement (QC-200)

Select the correct lens for the component being measured, based on the size of the component and field of view requirements (refer to magnification tables on page 20).

Focus on the component or feature being measured, firstly use the Z axis coarse control and then the fine control until the component or feature is in focus.

A measurement is made by moving the stage and subject under the cross-line graticule, visible through the dynascopic viewing head.

Features and dimensions are measured by aligning the cross-line with the desired feature and entering the preset number of points evenly distributed around the feature.*

A point is measured by aligning the cross-line on a single point.

Lines can be measured by aligning the cross-line at a minimum of two points.

Circles can be measured by aligning the cross-line at a minimum of 3 points on its circumference.

The software will calculate the result based on the points entered and display in the results window. Distances are calculated by selecting relevant features and selecting the distance function.

The accuracy of the stage movement is achieved by the application of NLEC (Non Linear Error Correction) which compensates for any mechanical stage errors across the calibrated stage area. The unique NLEC file, relating to the relevant stage is stored in the Quadra-Chek.

*Further Details on taking measurements can be found in the relevant Quadra-Chek user guide.

Taking a measurement (QC-300/QC-5000 VED)

Select the correct lens for the component being measured, based on the size of the component and field of view requirements (refer to magnification tables on page 20).

Focus on the component or feature being measured. Use the Z axis control until the component or feature is in focus.

A measurement is made by moving the stage so that subject or the start of the subject is within the field of view, dependent on the feature being measured.*

A point is measured by aligning the simple tool on a single point. Lines can be measured by aligning the simple tool on two points (minimum) on the line. Circles can be measured by aligning the simple tool on three points (minimum) around the circle. A point can also be measured by selecting the single or multipoint tool on the QC-300 and probing single or multiple points on selected features.

Features and dimensions are measured by selecting the appropriate QC-5000 video tool, from the toolbar, aligning the tool over the feature being measured. After performing a simple tool teach the tool is fired and the predetermined number of points will scan across the tool area and find the edge of the feature.

The software will calculate the result based on the points entered and display in the results window. Distances are calculated by selecting relevant features and selecting the distance function.

*Further Details on taking measurements can be found in the relevant Quadra-Chek user guide.

Good working practices

When selecting 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 and then 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.

Note: ***Contact your local Vision Engineering representative for full details of available training programs.***

WARNING

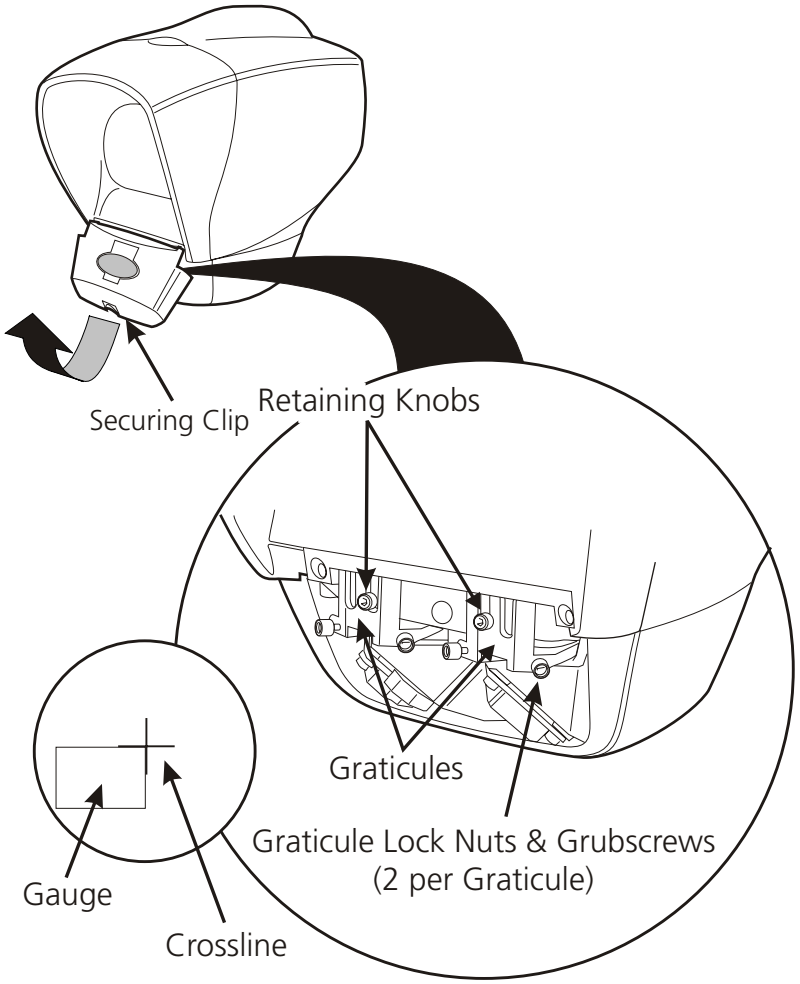
DISCONNECT THE MAINS POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE ROUTINE

Routine maintenance is important for the longstanding of the Hawk Measuring System. For more complex maintenance contact the local Vision Engineering representative.

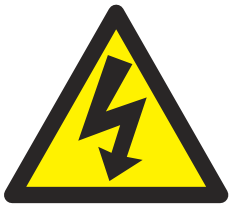
Graticule adjustment

- Undo the securing clip at the base of the front cover and lift the cover off.
- 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 grubscrews. Once the image is located, lock the grubscrews 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.***



Changing the illuminator lamp



WARNING

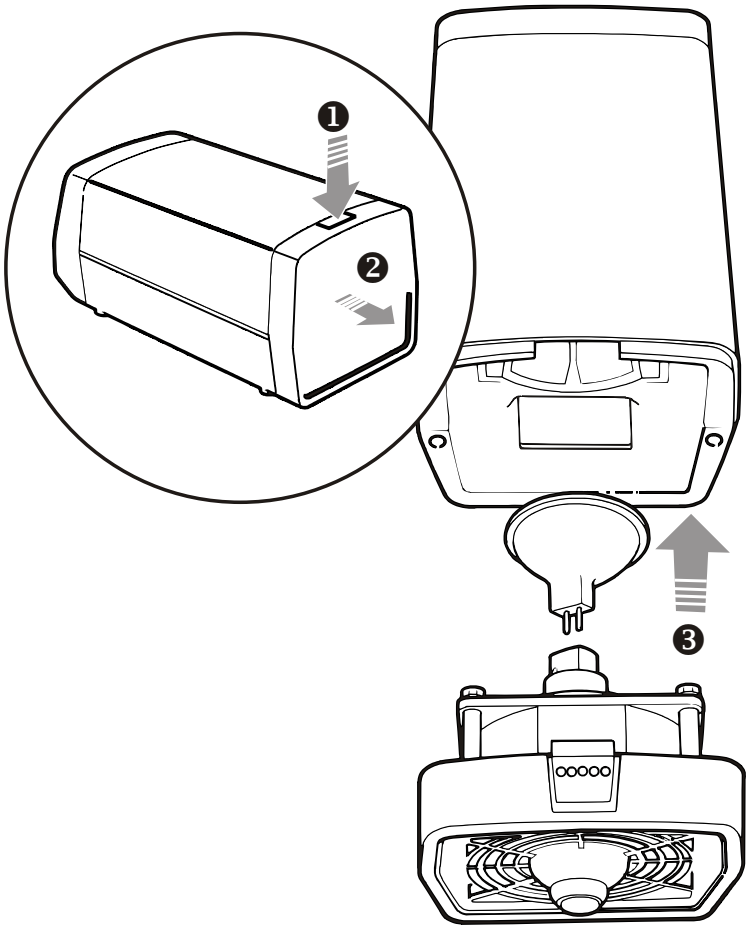
REMOVE POWER FROM THE SYSTEM BEFORE OPENING THE CASE.

CAUTION: Allow the illuminator to cool down before carrying out this task.

- Press down the lamp/fan assembly release button ❶.
- Lift out the lamp/fan assembly ❷.
- Remove the lamp as shown ❸.
- Insert the replacement lamp and check that it is fully pushed into the lamp holder.

Note: ***DO NOT touch the base, pins or filament assembly of the new bulb during installation. Oil from hands can cause premature bulb failure. The bulb should only be held by its reflector.***

- Periodically inspect the cooling fan and its vents for debris build-up. The front and rear vents must be clean to allow adequate airflow. Inadequate airflow will result in increased operating temperatures and reduced bulb life. The fan should be running whenever power is supplied to the illuminator.



General care

- Cover the Hawk with a dust cover when not in use.
- Remove dust with a soft brush or cleaning cloth.
- The viewing screen and lenses should be cleaned with a lens cleaning cloth.
- Keep accessories in a dust-free environment when not in use.

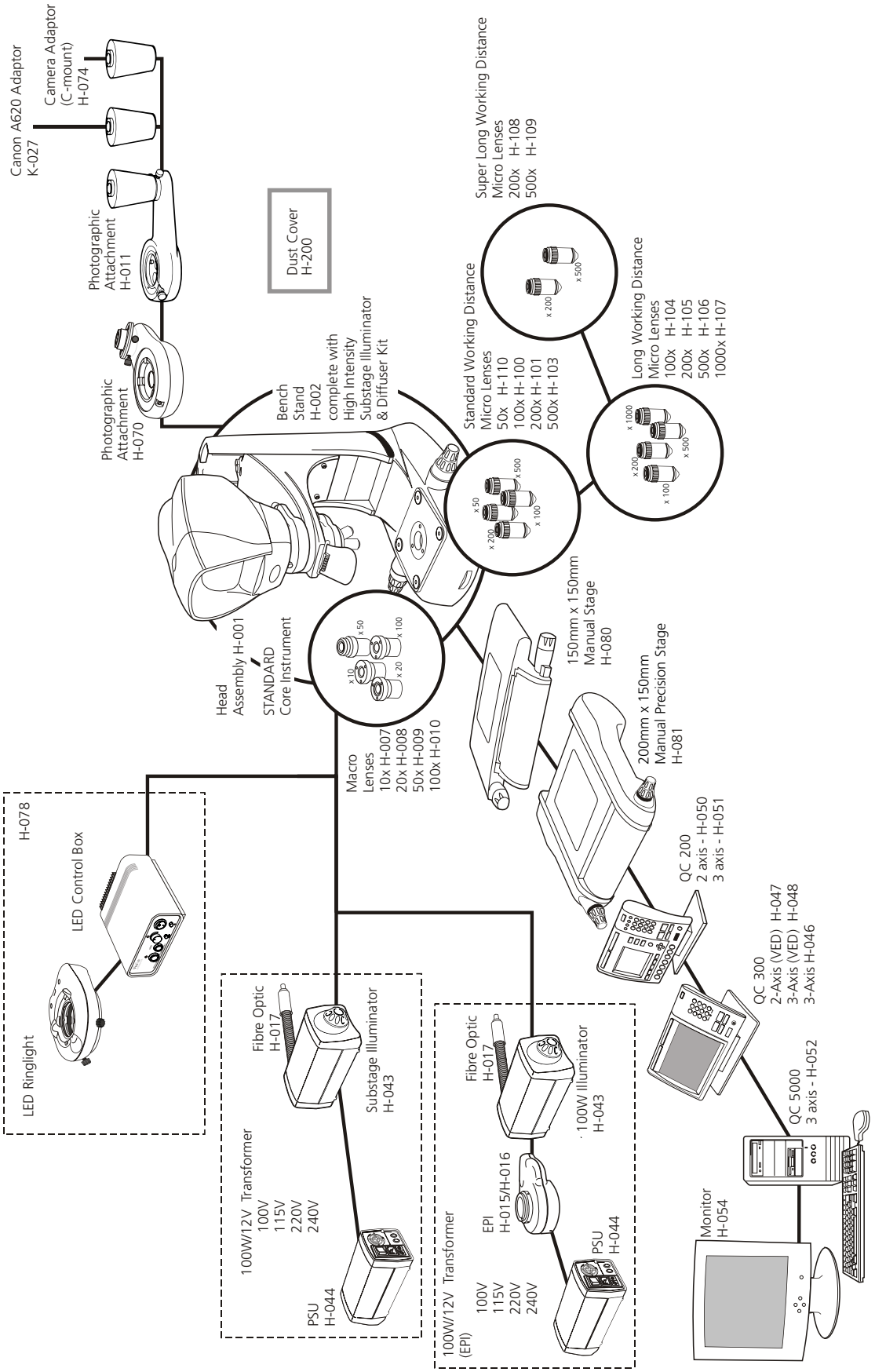
Consumable and replacement parts

Item	Specification	Quantity in Pack	Part Number
Substage/Episopic Bulb (Illuminator Bulb)	100w/12v Halogen Lamp	1	LAM-1770
Spotlight Bulb	20w/12v Lamp	1	LAM-1300
Stage Glass	150x150mm	1	201-B0686
Stage Glass	200x150mm	1	184-B0227
Stage Glass	300x225mm	1	159-B0394
Stage Glass	400x300mm	1	159-B0452
Anti-Glare shield	Hinged Anti-Glare shield	1	188-A1001/A
100W PSU Fuse	1.6 amp Anti-Surge	1	FUS-0243
100W PSU Fuse	800 ma Anti-Surge	1	FUS-0255
150W PSU Fuse	2.5 amp Anti-Surge	1	FUS-0395
150W PSU Fuse	1.5 amp Anti-Surge	1	FUS-2367

Environmental conditions

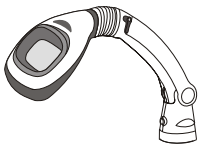
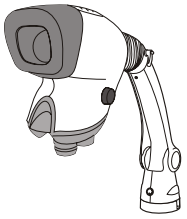
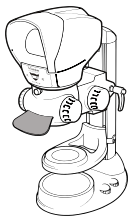
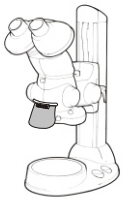
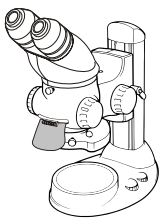
Hawk is an accurate, industrial gauging instrument. To achieve the optimum accuracy and repeatability, the following considerations should be taken into account:

- Position the Hawk on a firm, rigid table.
- Do not position the instrument near any source of vibration.
- Ensure that the 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.

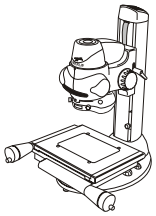
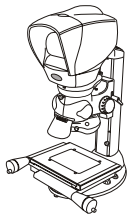

Canon A620 Adaptor
K-027
Camera Adaptor
(C-mount)
H-074
Photographic
Attachment
H-011
Photographic
Attachment
H-070
Dust Cover
H-200
Super Long Working Distance
Micro Lenses
200x H-108
500x H-109
Standard Working Distance
Micro Lenses
50x H-110
100x H-100
200x H-101
500x H-103
Long Working Distance
Micro Lenses
100x H-104
200x H-105
500x H-106
1000x H-107
Bench
Stand
H-002
complete with
High Intensity
Substage Illuminator
& Diffuser Kit
Head
Assembly H-001
STANDARD
Core Instrument
Macro
Lenses
10x H-007
20x H-008
50x H-009
100x H-010
150mm x 150mm
Manual Stage
H-080
200mm x 150mm
Manual Precision Stage
H-081
QC 200
2 axis - H-050
3 axis - H-051
QC 300
2-Axis (VED) H-047
3-Axis (VED) H-048
3-Axis H-046
QC 5000
3 axis - H-052
Monitor
H-054
H-078
LED Control Box
LED Ringlight
Fibre Optic
H-017
Substage Illuminator
H-043
100W/12V Transformer
100V
115V
220V
240V
PSU
H-044
Fibre Optic
H-017
100W Illuminator
H-043
EPI
H-015/H-016
PSU
H-044
100W/12V Transformer
(EPI)
100V
115V
220V
240V

Vision Engineering manufactures a wide range of stereo inspection and non-contact measuring systems. The following tables provide a summary of the products utilising Vision's technology. For more information on any of these products either visit the website or contact the nearest Vision Engineering branch/distributor.

Stereo inspection systems

Product	Picture	Features	Description
Lentis		• 2.5 dioptres • Multi layered anti reflective coated lens	A state of the art bench magnifier for inspection, manipulation and material rework.
Mantis		• x2 - x20 Magnification • Shadow-free LED cold illumination, both surface and substage • Long working distances, large depth of field	The Mantis family is a unique range of optical systems without eyepieces, for intricate tasks requiring superb quality viewing over long periods of use. Available with universal arm or rigid bench stand option.
Lynx		• X2.1 - X120 magnification • Camera option • Optical viewing head (replaces conventional eyepieces).	Advanced optical system (without eyepieces) stereo zoom microscope. Available in boom and rigid stand configuration with a wide range of optional accessories (e.g. lighting, cameras).
Alpha		• x2.1 – x160 magnification • Camera option • Expanded Pupil eyepieces	Expanded Pupil eyepiece stereo zoom microscope. Available in boom and bench stand configuration with a wide range of optional accessories (e.g. lighting, cameras)
Beta		• x2.1 – x160 magnification • Camera option • Conventional eyepieces	Conventional eyepiece stereo zoom microscope. Available in boom and bench stand configuration with a wide range of optional accessories (e.g. lighting, cameras)

Non-contact measuring systems

Product	Picture	Features	Description
Merlin		• 150mm x 100mm stage • x10 - x50 mag options • QC-300 Microprocessor • Manual/Automatic Video Edge Detection	2-axis video measuring system with touch screen video processor. Powerful yet simple to use, ideal for a wide range of gauging applications.
Peregrine		• 150mm x 100mm stage • x10 - x50 mag options • QC-300 Microprocessor • Automated video edge detection	2-axis video measuring system with optical and video measurement capability. Simple to use, allowing for quick results every time.
Kestrel		• 150mm x 100mm stage • x10 - x50 mag options • QC200 Microprocessor • Optical viewing head (replaces conventional eyepiece)	Entry level, 2-axis measuring system. Ideal for shop floor gauging applications.
Hawk automatic		• 200mm x 150mm stage • x10 - x100 mag options • Video Edge Detection • Motorised stage movement • 2 or 3 axis capability	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.

SERVICE & CALIBRATION RECORD

Hawk 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. Shipment costs for warranty repairs, to and from Vision Engineering facilities will not, normally, be borne by 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, expressed 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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www.visioneng.com