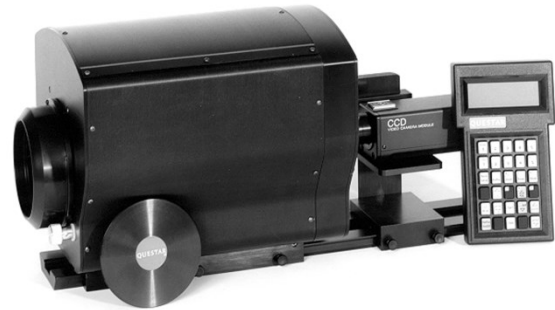


## Motorized Step Zoom QM-1 Long Distance Microscope

Optically identical to the Questar QM-1 microscope, the motorized Step Zoom™ design is in response to a need for a rugged variable magnification/multi-filtered lens system. The barrel and optical carriage design provide excellent boresight capabilities, with stepper motor control for performance and repeatability on focal length changes.

Expressly designed for video use and now further enhanced by microprocessor control, the instrument features focus maintenance during magnification changes and improves ease of use. Added to this are the capability for extended cable runs from the hand terminal, or remote control from a personal computer with optional software control.



Questar StepZoom™ lenses offer a compactness and variation in focal lengths unavailable with continuous zoom lenses. The SZ M1 offers five power changes and five selectable neutral density or spectral filters for optimized performance under varying conditions. Remote control is performed from a full function microprocessor hand terminal with four line display reporting the status of all lens functions. Focus, focal length and filter changes are quick with no refocus required throughout the focal length range using the built-in Parfocal user programmable settings. Automatic light level control is an integrated option.

### **Performance:**

|   |  |       |      |
|---|--|-------|------|
| Type:                                     | Maksutov Cassegrain Catadioptric   |       |      |
| Working Range:                            | 560 mm (22 inches) to 1520 mm (66 inches), subject plane to front element. |       |      |
| Clear Aperture:                           | 89 mm (3.5 inches).  |       |      |
| Entrance Pupil:                           | Primary Mirror 96 mm (3.8 inches).   |       |      |
| Relative Aperture/<br>Numerical Aperture: | Working Distance   | N.A.  | f/no |
|   | 1400 mm (55 inches)  | .0288 | 16.8 |
|   | 1020 mm (40 inches)  | .0385 | 12.9 |
|   | 700 mm (27.5 inches)   | .0511 | 10   |
|   | 560 mm (22 inches)   | .0580 | 8.7  |

|                      |  |
|----------------------|--|
| Resolution:          | Better than 3 microns at 560mm (22 inches)<br>Resolution is defined as the measurable separation of a space between two bars on a resolution target. Each instrument is tested to meet these figures |
| Magnification:       | To 125 times visual, to 12 times at image plane.<br>Variable depending on BFD, Auxiliary Lens & Imaging Device   |
| Format:              | Diffraction limited field 12 mm, 18 mm nearly diffraction limited.   |
| Back Focal Distance: | 70 mm (2.75 inches) minimum measured from back plate.  |

### **Optics:**

|                   |  |
|-------------------|--|
| Corrector:        | BK7, Magnesium Fluoride AR coated, 89 mm (3.5 inches) diameter.              |
| Primary Mirror:   | Pyrex substrate, aluminum coated, SiO overcoat. 96 mm (3.8 inches) diameter. |
| Secondary Mirror: | Aluminum coating on R1 surface of Corrector, 22 mm diameter.                 |
| Beamsplitter:     | BK7, Multi coated 70/30  |
| Baffling:         | Helix in main baffle tube, all internal surfaces anti-reflection coated.     |
| Image Sensor:     | For use with video cameras of any type, C-mount standard.                    |

## **Electromechanical:**

|               |  |
|---------------|--|
| Drive:        | 1.8 degree step motor open loop drive for all functions, with microprocessor control. Opto interrupter end of travel and home position sensing.  |
| Control:      | Motorola M68HC11 onboard microcontroller with remote hand terminal. Selection of focal length by direct access buttons or sequential up/down. Selection of filter by direct access. Bidirectional intelligent turret drives move in direction of shortest distance to next chosen focal length/filter position. Parfocalization software maintains focus for all length changes, selectable on/off (step zoom). Focus acceleration and velocity adjustable. Last position and motion parameters savable as power up defaults. All software in 128K EPROM. User configured functions and parameters stored in non-volatile EEPROM on microcontroller. |
| Terminal:     | 30 key hand control unit, with 4 X 20 character display; backlit supertwist type. Keypress audible beep, user switchable on/off. Communication RS-422 standard, 9600 baud. Maximum distance terminal to instrument 1200 meters (4000 feet). 6 wire connecting cable with modular end connectors 10 ft. coiled cable standard length, longer option available.  |
| System Power: | 12VDC operation. Auto-ranging switchmode desktop power supply: 90-250 VAC/47-63Hz is supplied to connect and convert A/C to 12VDC. Power entry at instrument and hand terminal. 6 foot cord from supply to instrument. IEC power input for worldwide use.  |

## **Mechanical:**

|                  |  |
|------------------|--|
| Barrel:          | Aluminum plate, machined & black anodized, modular fabricated construction. Built-in 2 position beam splitter assembly, Sheet aluminum outer cover shell.  |
| Lens Cell:       | Hollow bar, machined & black anodized, precision turned mounting surface & pilot flange  |
| Focus Mechanism: | Corrector focus 6 point bearing structure, 6 precision pressed & loaded bearing & matched stainless steel slide rods, direct drive lead screw focuser & matching anti-backlash ball nut & bronze support bearings with variable speed step motor drive.  |
| Mirror Mounting: | Fixed position, 3" diameter stainless steel mounting plate, matched & fitted to barrel assembly, mirror thimble precision thread to match plate  |
| Turret Section:  | Modular design two piece aluminum housing and cover, machined. 'P' thread camera port, Two turrets: lens/filter, aluminum, 140mm (5.5 inch) diameter, direct tooth belt drive. Bronze bushing/roller thrust bearings on 3/4" stainless steel shaft. Five positions. Adjustable auxiliary lens cells. See optical section for selection of filters & focal lengths. |
| Knobs            | Aluminum   |
| Hardware         | Stainless steel, All aluminum parts black anodized. All exterior surfaces anodized. Special colors by quotation. All hardware stainless steel. Includes hardshell case, lens covers, swivel coupling, C-mount adapter, cables, manuals.  |
| Mounting:        | 1/4" - 20 (3X) mounting holes on bottom housing plate.   |
| Dimensions:      | 35.5 cm      14"      long<br>21.6 cm      8.5"      tall<br>21 cm      8.3"      wide   |
| Weights:         | Instrument:    6 kg    13.2 pounds<br>Terminal:      .4 kg    1 pound<br>Power Supply    .5 kg    1.1 pound  |

### ***Optional Linear Neutral Density Filter***

Modular design, .625" thick, mounts directly to Microscope turret rear housing. Motorized control, either from hand terminal or automatic light control with option light control unit.

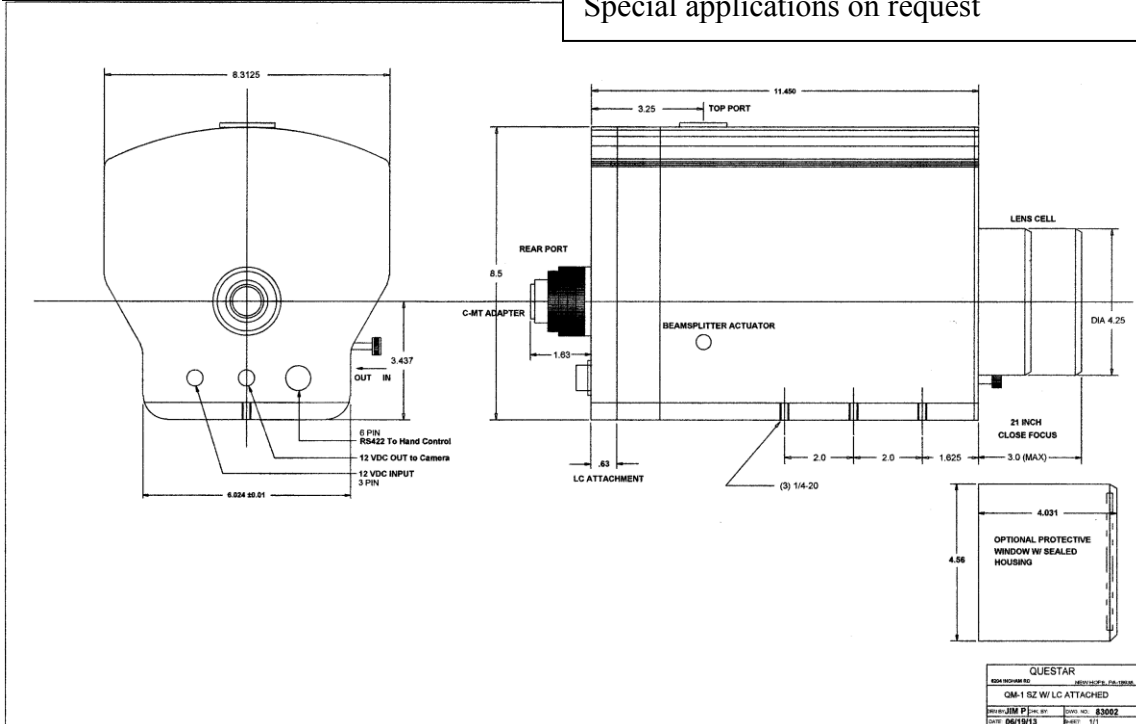
**Available focal changer:**

|             |           |
|-------------|-----------|
| 100 mm      | .25X      |
| 130 mm      | .50X      |
| 172 mm      | .70X      |
| <b>OPEN</b> | <b>X*</b> |
| 1.5X        | 1.5X      |
| 2.0X        | 2.0X      |

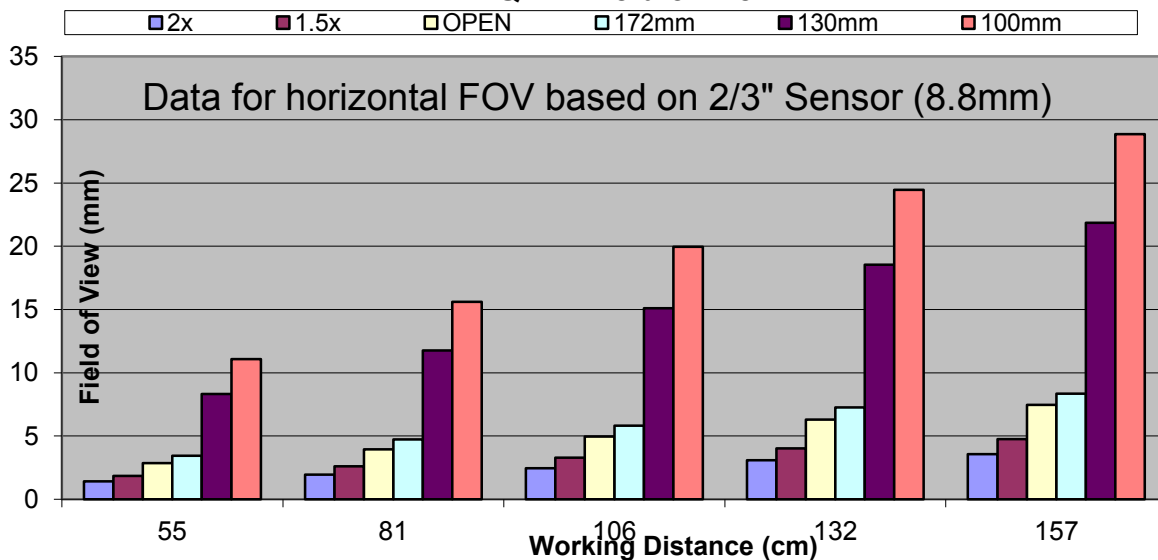
\*System base power, required

**Available filter selections:**

- N.D. 0.1** full wratten series available
- N.D. 0.3
- N.D. 0.8**
- N.D. 1.0
- N.D. 1.5** (All ND filters evaporated chrome)
- N.D. 2.0
- N.D. 2.5** (standard filters are bold)
- Special applications on request



**QM-1 Field of View**



**Questar Corporation**  
 6204 Ingham Road  
 New Hope, PA 18938  
 USA

Telephone: 215-862-5277  
 Fax: 215-862-0512  
 Email: [questar@QuestarCorporation.com](mailto:questar@QuestarCorporation.com)  
 Web: [www.QuestarCorporation.com](http://www.QuestarCorporation.com)