

**PORTABLE RADIOMETER**  
**MODEL L203 SMU**  
**HANDBOOK SUPPLEMENT**

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## 1 INTRODUCTION

The Macam L203 SMU Photometer is a customised portable instrument designed for accurate measurement of illuminance in Lux or footcandles, luminance and spot luminance in  $\text{cd.m}^{-2}$  or footLamberts, according to the type of head supplied with the unit.

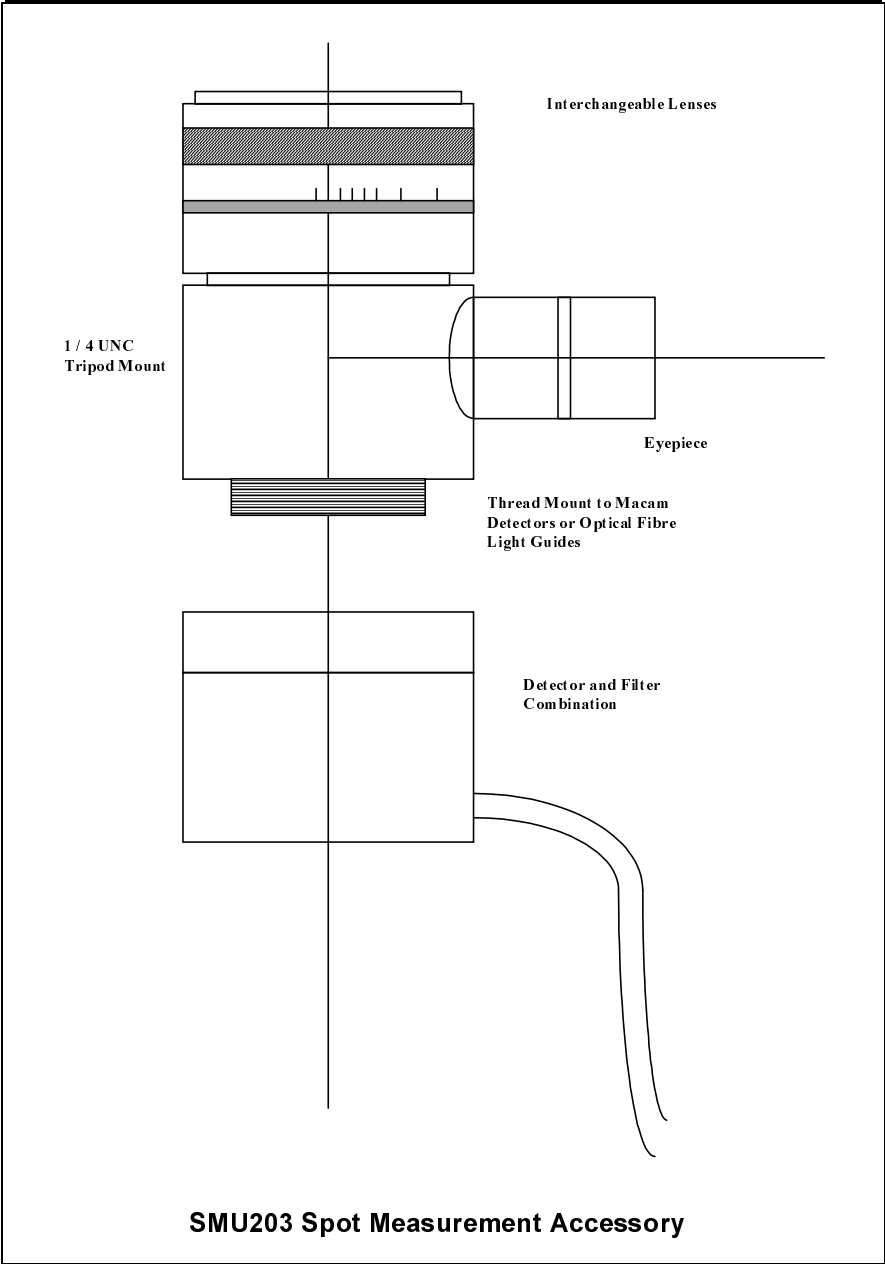
The photometer comprises of a hand held display unit with micro processor control, a detector / amplifier assembly / connecting cable, spot measuring unit and an intermediate photopic filter ring, and other possible accessories of a cosine corrected photopic filter ring for illuminance measurements (L203 illuminance/luminance model) and a photopic  $6^\circ$  field of view lens assembly.

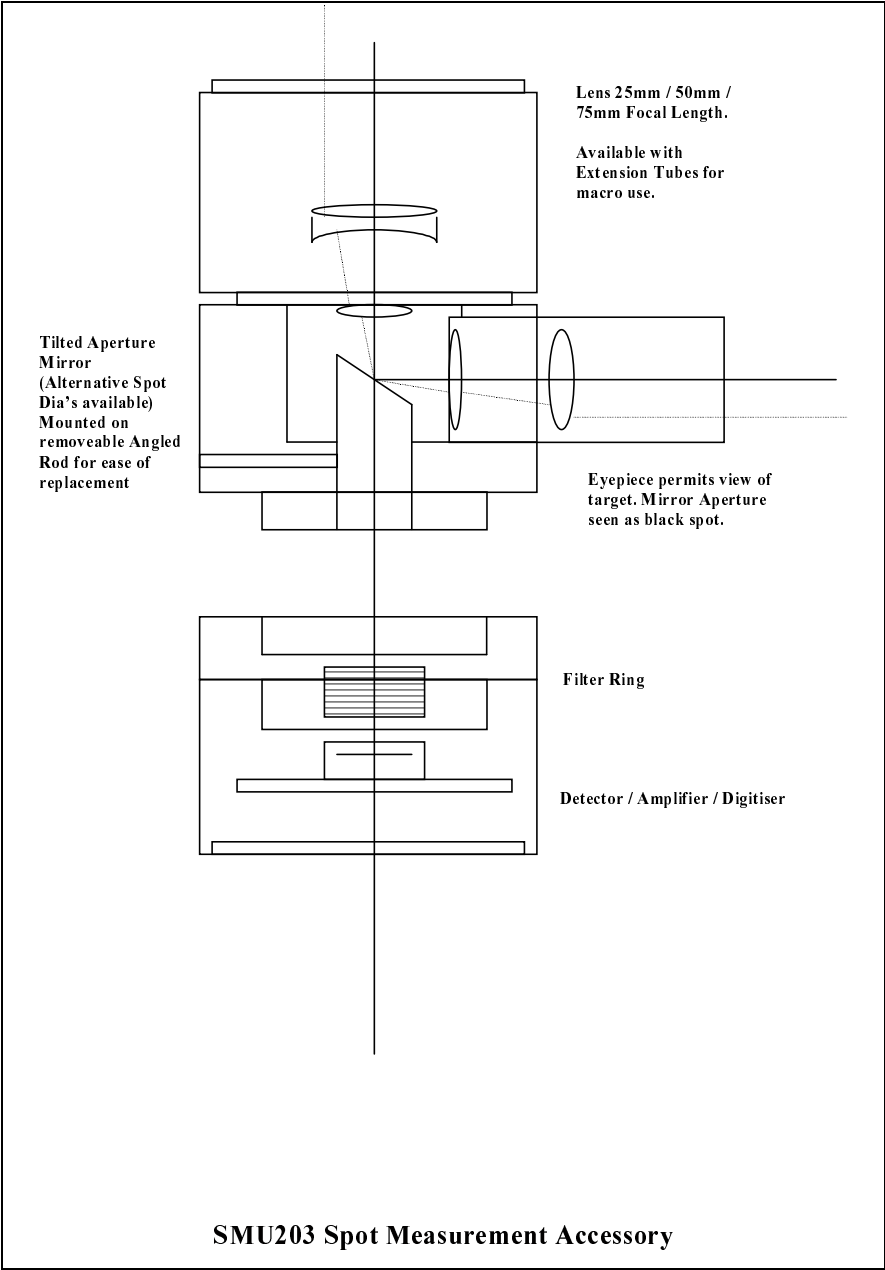
The reflex viewing spot measuring unit, model SMU203 is a compact telescope with off-axis eyepiece, permitting accurate measurements of luminance when used in conjunction with the L203 photometer, detector and photopic filter. The eyepiece provides a view of the imaged scene superimposed on an aperture mirror. The aperture (seen as a dark spot in the centre of the field of view) allows light to travel directly to the detector or light guide. This method of detection gives high levels of immunity from scattered light.

**2 SPECIFICATION CHANGES:**

## DISPLAY UNIT (Ranges:)

- i) Illuminance  
with CIE INT-112  
Photopic Filter
- Up to 5 full scale decades measuring from:  
0 to 1.9999 lux  
0 to 19.999 lux  
0 to 199.99 lux  
0 to 1999.9 lux  
0 to 19999 lux  
Resolution 0,0001 lux on range 1.
- Up to 4 full scale decades measuring from:  
0 to 1.9999 fc  
0 to 19.999 fc  
0 to 199.99 fc  
0 to 1999.9 fc  
Resolution 0,0001 fc on range 1.
- ii) Luminance  
with SMU 203-25  
(25 mm f/l lens)
- Up to 4 full scale decades measuring from:  
0 to 199.99 cd.m<sup>-2</sup>  
0 to 1999.9 cd.m<sup>-2</sup>  
0 to 19999 cd.m<sup>-2</sup>  
0 to 19999 x 10 cd.m<sup>-2</sup>  
Resolution 0,01 cd.m<sup>-2</sup> on range 1.
- Up to 4 full scale decades measuring from:  
0 to 199.99 fL  
0 to 1999.9 fL  
0 to 19999 fL  
0 to 19999 x 10 fL  
Resolution 0,01 fL on range 1.
- iii) Luminance  
with SMU 203-50  
(50 mm f/l lens)
- Up to 4 full scale decades measuring from:  
0 to 199.99 cd.m<sup>-2</sup>  
0 to 1999.9 cd.m<sup>-2</sup>  
0 to 19999 cd.m<sup>-2</sup>  
0 to 19999 x 10 cd.m<sup>-2</sup>  
Resolution 0,01 cd.m<sup>-2</sup> on range 1.
- Calibration
- Absolute calibration accuracy estimated as  
± 5.0 % traceable to NPL standards.





### 3 OPERATION

#### SPOT LUMINANCE SETTING UP

- 1) Carefully screw the CIE INT-112 intermediate filter ring to the SMU203 telescope and the SD222 detector to the intermediate filter ring. Remove the rear lens cap and screw either the 25, 50 or 75 mm 'C' mount lens to the SMU. If the extension tube is fitted check the calibration certificate for the multiplication factor.
- 2) With the unit OFF, plug the detector 8 way connector into the socket on the top of the display unit.
- 3) Press and release the power switch on the L203 display key pad. The micro controller will initiate with the display momentarily showing:-



The radiometer will now search for the optimum range on the detector amplifier. A typical display is shown below.



An LED will illuminate indicating the units. This will be the same units prior to the last power off.

- 4) Press and release the *UNITS* switch to select the correct units for luminance measurements. The correct setting will be one of  $\text{cd.m}^{-2}$ , fL or Aux as detailed on the calibration certificate, supplied with the meter.
- 5) View the source to be measured by sighting through the eyepiece viewer, noting that the size of the source must be greater than the black spot observed on the reflex mirror. Light sources that appear to be totally obscured by the black spot will not be accurately measured. In this case move toward the source until it overfills the spot.

**Important note:** In all situations other than darkroom operation, the eyepiece blanking cap must be used to cover the viewer once the telescope has been correctly aligned with the target source. Failure to do so may lead to incorrect luminance values being given.

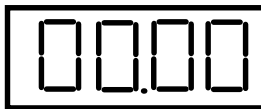
## ZERO

It is recommended that the photometer amplifier is nulled periodically. To do this place lens caps over both the front of the lens and the eyepiece. It is important that *both* caps are in place before commencing the zero operation as it is possible to obtain a false zero level (and consequently incorrect readings) if ambient light levels are high and either of the optical inputs are unblocked.

Press and release the *ZERO* switch, the display will show:-



The micro controller will now measure the amplifier offset on each of the available gain ranges and store these values in the non-volatile memory. All subsequent measurements will first have one of these offsets subtracted before displaying the measurement. At the end of the nulling sequence the display will show:-



Remove the light covers from the detector. The equipment is now ready for use.

## AVERAGE

When the light is unstable, press and release the *MODE* switch. The photometer will now switch to manual ranging, Manual LED on, if not yet previously in manual ranging. The Average LED will now switch on, but the Units LED will remain unchanged.

To start an average sequence press and release the *HOLD/RUN* switch. Immediately the display will show a fluctuating signal, reflecting the light source fluctuations. After a short time the amplitude of the fluctuations will decrease and the display will begin to show a reading which represents the average light level during the period of the measurement.

### 3 OPERATION (continued):

At any time the averaging process can be halted by pressing the HOLD/RUN button.

At any time the averaging sequence can be reset by pressing and releasing the FUNCTION RESET switch.

If the light level fluctuations are large and any one reading causes the detector amplifier to overload at this range the averaging process will be terminated and the display will show:-



To avoid an overload conditions RESET the photometer and Manually change the RANGE to a lower lever. e.g. from a 34.00 range to 34.0.

#### MIN. & MAX. LEVELS

During an average measurement the maximum and minimum values attained in the period are recorded. Press *HOLD* to halt the averaging sequence. Press the MODE button to select between *Average*, *Min* and *Max*. Note. The Integrate display may overload and display - 0 L -.

It is also possible to view a *MIN* or *MAX* recording sequence by selecting *MIN* or *MAX* prior to selecting *RUN*.

Press *FUNCTION RESET* to set the maximum and average values to zero and the minimum to - 0 L -. Note the *FUNCTION RESET* will operate during a measurement sequence or in the *HOLD* mode.

#### INTEGRATE

For measurements of the integrated dosage or exposure press the MODE switch to select *Integrate*. Press the RUN switch to start the measurement. The display will now autorange as the dosage increases.

Note the detector amplifier will not autorange and as with Average measurements if the amplifier overloads the display will show - 0 L - and the measurement will halt.

**3 OPERATION (continued):**

Units for integrated measurements are  $\text{mJ}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$  or  $\text{J}\cdot\text{m}^{-2}\cdot\text{sr}^{-1}$  .

At the end of the integration period *HOLD* the display. Use the *MODE* switch to also display the *Min*, *Max* and *Average* values.

Press *FUNCTION RESET* to set the integrate, maximum and average values to zero and the minimum to - 0 L -. Note the *FUNCTION RESET* will operate during a measurement sequence or in the *HOLD* mode.

## 4 EYEPIECE ADJUSTMENT

The SMU203 eyepiece is set for zero dioptre correction. If it is necessary to adjust for operators vision, the eyepiece barrel can be unlocked (the grub screw access is above the detector mounting thread), and the barrel moved into the body of the SMU by up to 1mm (giving over 3 dioptre adjustment). Ensure that the barrel is relocked after adjustment.

## 5 LENS CARE

If the external optics of the SMU203 become dirty, remove loose dust with a photographic 'puff' brush or a proprietary dust remover (e.g.; Dust-Off). More difficult marks may be removed using Iso-Propyl Alcohol and lens tissue. (Do not flood the optics with alcohol, apply to the lens tissue and gently wet the optics surface.)

Cleaning of the internal optics is not recommended. With care dust may be blown out, but the mirror is easily damaged. Contamination is usually cosmetic and unlikely to affect the instruments performance.

## 6 MOUNTING

The SMU203 is fitted with a ¼"-UNC tripod mount thread on the flat beneath the main body. Several tripods are available as accessories.

## 7 LENS SELECTION CHART

Focal Length (mm)	F No (Min)	Field of View (Min)	Spot FOV	Spot Size at 1m	Min Focus Distance
25	1.6	22°	5°	9cm	0.3m
50	1.8	11°	2.5°	4.5cm	1m
75	1.3	7.5°	1.5°	2.5cm	1m

## 8 USE OF EXTENSION TUBES

Minimum operating distance (and spot size) can be reduced through the use of extension tubes. With the standard 25mm lens details of less than 1mm can be measured at just several centimetres range.

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