LUXCAL250 & LUMICAL50

PHOTOMETER CALIBRATION

SYSTEM

USER MANUAL

Version 1 - February 2019

Bentham Instruments Limited

2 Boulton Road, Reading, Berkshire, RG2 0NH, U.K.

Tel: +44 (0)118 975 1355 **Fax: +44 (0)118 931 2971**

Email: sales@bentham.co.uk **Internet: www.bentham.co.uk**

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1 INTRODUCTION

Thank you for your purchase of the Bentham LuxCal250 including LumiCal50 photometer calibration. The documentation for this product consists of this User's Manual with reference made to specific component manuals where further information is sought. To get the most from this measurement system, please be sure to read all instructions thoroughly and keep them where they will be read by all who use the product.

2 GUARANTEE

Bentham Instruments warrants each instrument to be free of defects in material and workmanship for a period of one year after shipment to the original purchaser. Liability under this warranty is limited to repairing or adjusting any instrument returned to the factory for that purpose. The warranty of this instrument is void if the instrument has been modified other than in accordance with written instructions from Bentham, or if defect or failure is judged by Bentham to be caused by abnormal conditions of operation, storage or transportation.

This warranty is subject to verification by Bentham, that a defect or failure exists, and to compliance by the original purchaser with the following instructions.

Before returning the instrument, notify Bentham with full details of the problem, including model number and serial number of the instrument involved. After receiving the above information, Bentham will issue an RMA reference number and provide shipping instructions.

After receipt of Shipping instructions, ship the instrument "carriage paid" to Bentham. Full liability for damage during shipment is borne by the purchaser. It is recommended that instruments shipped to us be fully insured and packed surrounded by at least two inches of shock-absorbing material. Specific transit packaging as used in Monochromators etc. must be installed.

Bentham reserves the right to make changes in design at any time without incurring any obligation to install same on units previously purchased.

This warranty is expressly in lieu of all other obligations or liabilities on the part of Bentham, and Bentham neither assumes, nor authorises any other person to assume for it, any liability in connection with the sales of Bentham's products.

NOTHING IN THIS GUARANTEE AFFECTS YOUR STATUTORY RIGHTS.

3 NOTICE FOR CLIENTS IN EUROPEAN UNION

This product is designated for separate collection at an appropriate collection point. Do not dispose of as household waste.

Bentham are fully WEEE compliant, our registration numberis WEE/CB0003ZR.

Should you need to dispose of our equipment please telephone +44 (0) 113 385 4352/4356, quoting account number 135419

4 CONTACT BENTHAM

Bentham Instruments Limited
2, Boulton Road,
Reading,
Berkshire,
RG2 0NH,
UK

sales@bentham.co.uk

www.bentham.co.uk

T:+44 (0)118 975 1355

5 SYSTEM REQUIREMENTS

3x USB- ports

2x main sockets

Bench space: 1.5m deep x 1.5m wide

Component	Current (220V) (A)	Power consumption (W)
ORM400	0.1	22
610 Power supply	1.9	350
TOTAL	**2**	**372**

Table 1: Luxcal250 Electrical Supply Requirements

6 SYSTEM COMPONENTS

1x LuxCal250 chamber including labjack and height gauge

1 x LumiCal50 integrating sphere

1x PSU_610 constant current power supply

1x ORM400 Picoammeter & power supply

1x DH400_VL luxmeter, UKAS calibrated

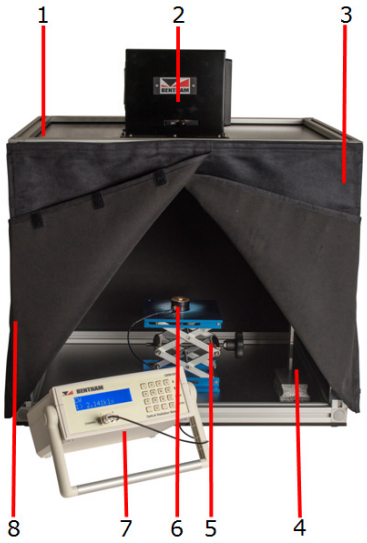
1x DH400_VL, 5° optic luminance meter, UKAS calibrated

1x Set of colour shift & ND filters

Miscellaneous

2x Red & black cables
1x Black fan cable, 3-pin
1x Mains cable, American plug connector
UKAS certificates

7 HARDWARE INSTALLATION



1	LuxCal250 chamber	**5**	Labjack
2	Luxmeter calibration source	**6**	Reference Luxmeter
3	Black out curtains	**7**	ORM400
4	Height gauge	**8**	Location (side) for LumiCal50

Figure 1: LuxCal250 System overview (notseen LumiCal50, reference luminance meter nor PSU_610

It is recommended to locate the LuxCal250 system on a bench at least 1.5m deep x 1.5m wide.

1 Position the LuxCal250 chamber central to the bench

2 Position the PSU_610 and ORM400 to one side of the LuxCal250chamber

3 Attach LumiCal50 integrating sphere to left hand wall of LuxCal250 chamber

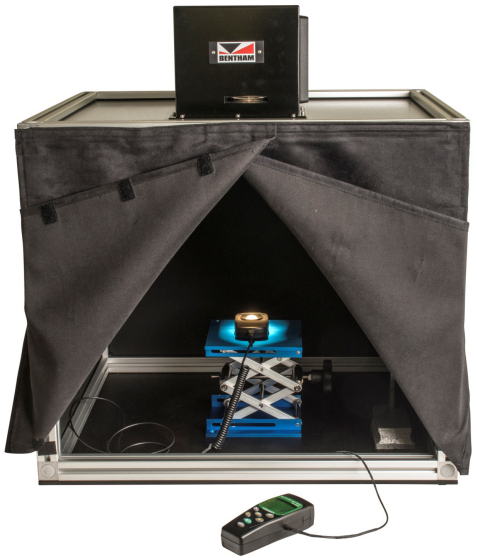
4 Connect PSU_610 to LuxCal250 or LumiCal50 source as required. Connect PSU_610 fan output to fan connector on LuxCal250Connect PSU_610 to mains using supplied

5 Connect PSU_610 to mains using mains cable provided and ORM400 using ORM400 power supply

6 Connect reference DH400_VL (luxmeter) to input 1 of ORM400, DH400_VL with 5° optic (luminance meter) to input 2 of ORM400

8 GETTING TO KNOW THE LUXCAL250 & LUMICAL50

8.1 LUXCAL250



The LuxCal250 houses a halogen source to the top which is set to 2856K by use of varying lamp current and installing a colour shift filter on the table to the top of the chamber. Various levels of illuminance are obtained by use of ND filters installed in the lamp housing from outside the chamber. The calibration certificate tells the user which filters to use.

The nominal plane is 175mm from the base of the chamber. A labjack has been provided to bring the reference luxmeter or DUT to the correct heights a height gauge used to ensure correct height set. A laser alignment aid can be brought in the beam to ensure reference luxmeter/ DUT central to beam.

The LuxCal250 is provided with the following filters:-

Level	Filter
1	81C
2	ND1+81C
3	ND1+81C +ND0.2 (on 81C)
4	ND2+81C
5	ND3+81B
6	N4 ONLY

8.2 LUMICAL50

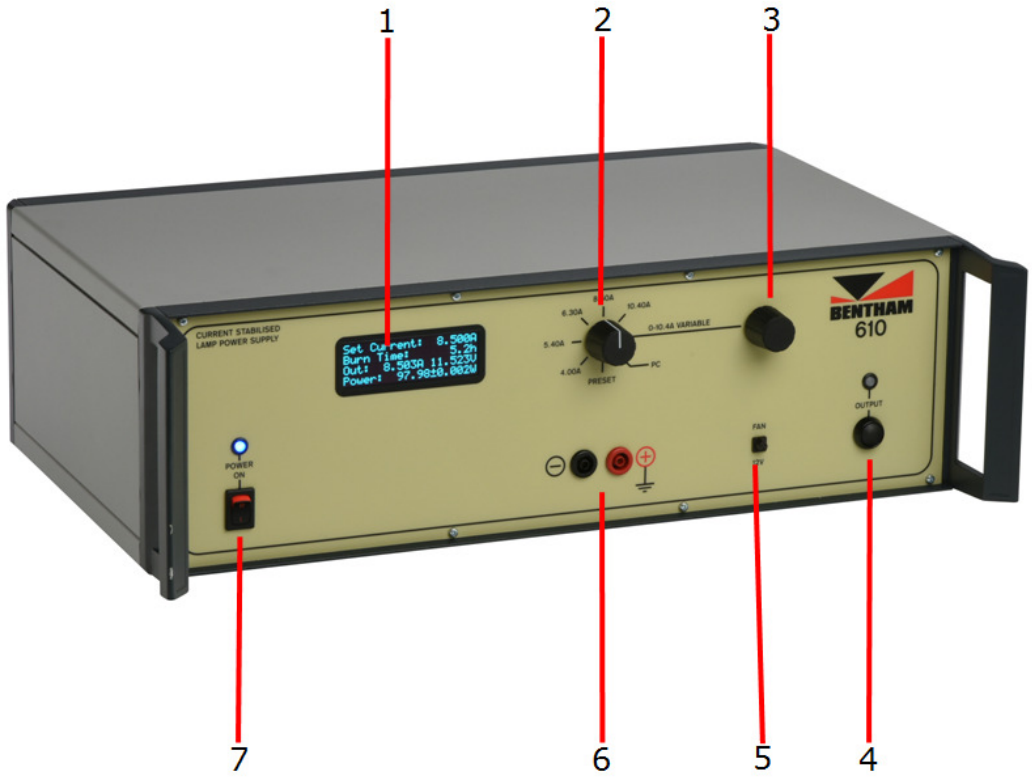
The LumiCal50 comrpises a barium sulphate coated integrating sphere with 100W halogen lamp to ensure uniform high luminance over the exit port. Attached to the left hand wall of the LuxCal250, the output of the LumiCal50 is brought to 2856K by using varying current and colour shift filters, whilst various luminance levels are obtained using ND filters.

The LumiCal250 is provided with the following filters:-

Level	**Filter**
1	81C
2	81C + ND0.2
3	81C +ND1
4	81C + ND2
5	81C + ND3
6	81C + ND4

8.3 PSU_610

The lamps of the LuxCal250 and Lumical50 are driven by a constant current power supply, the Bentham 610.



1	Display	**5**	Fan output
2	Current selector	**6**	Current output
3	Current adjust	**7**	Main switch
4	Lamp power on/off		

Figure 2: 610 Constant current power supply

The 610 is a constant current power supply, with a manual selection of current. The user should select the current according to the value reported in the calibration certificate. In general the 0-10.4A variable channel should be selected and the right hand black switch used to select the required current. Depress the right hand output button for a few seconds to power on and off the lamps.

The fan output powers the fan of the luxcal250 chamber and the alignment laser therein.

8.4 ORM400 & REFERENCE DETECTORS

The ORM400 picoammeter, associated with a reference lux and luminance meter with UKAS accredited calibration, is used to determine the reference lux or luminance level of the LuxCal250/ LumiCal50.

Connect to mains, the ORM400 should be powered on and hit enter twice to run in meter mode. The calibration factors for both reference detectors have been programmed on the ORM400. Hit 1 for channel 1 (luxmeter) and 2 for channel 2 (luminance meter)

8 LUXMETER CALIBRATION

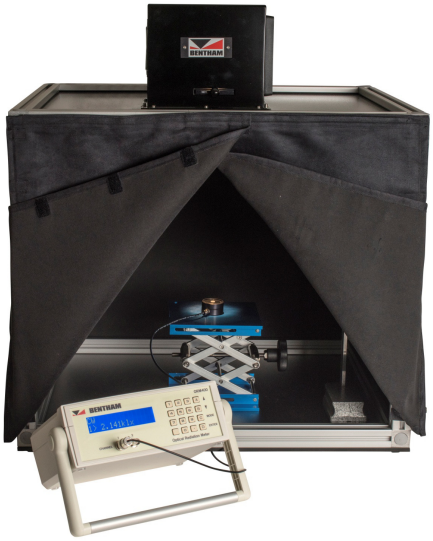
To the upper of the LuxCal250, a grit-blasted quartz halogen lamp is used as source. A facility is included to allow the insertion of ND filters (ND1, 2, 3 and 4 supplied) to perform measurements across the dynamic range without having to change the position of the device under test.

The sample plane of the LuxCal250 is located 175mm above the base of the unit. A height gauge is provided to ensure that the device under test is placed at this position; a lab-jack is used to accommodate the height of the device under test.

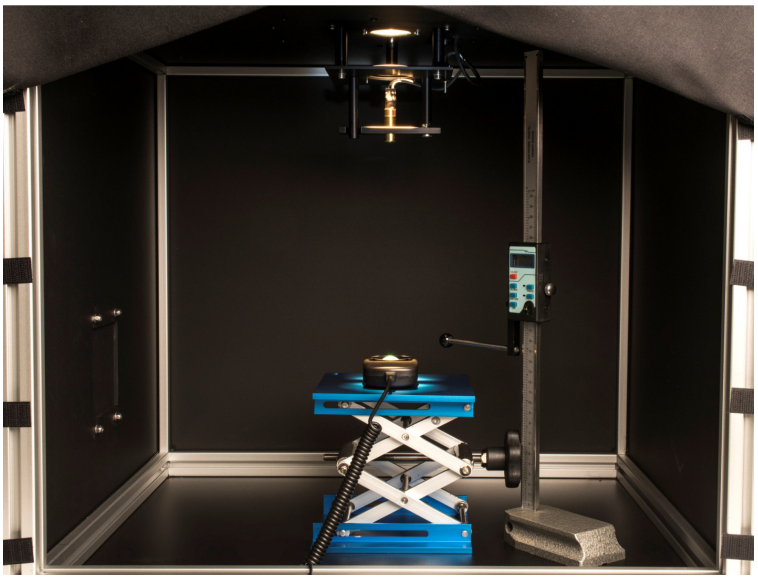
A colour shift filter and modification of lamp current ensures operation at 2856K in accordance with ISO/CIE 19476:2014.

For each level, the reference luxmeter should be used to determine the reference illuminance values. This has the benefit of not requiring return of the LuxCal250 unit to Bentham for re-calibration.

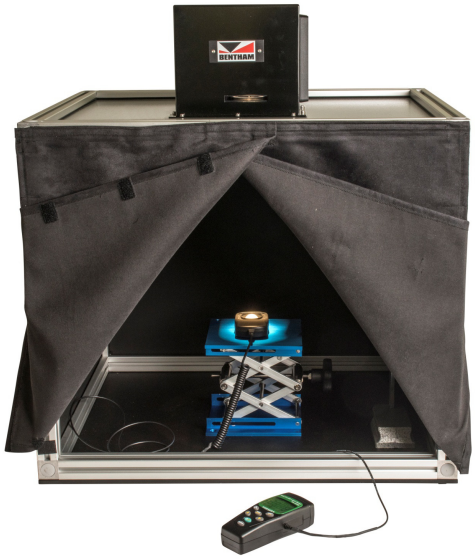
Level	Filter	Current (A)
1	81C	9.6
2	ND1+81C	9.4
3	ND1+81C +ND0.2 (on 81C)	9.5
4	ND2+81C	9.4
5	ND3+81B	9.8
6	N4 ONLY	9.8



A laser alignment aid is swung into the beam to ensure centralisation of the DUT

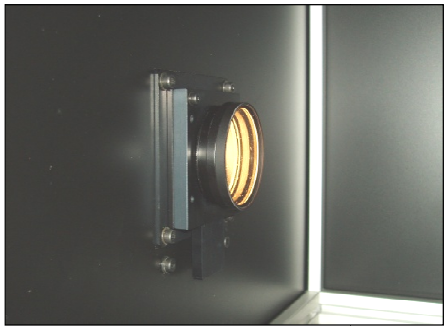


With the DUT set up, a curtain allows ensuring the device illuminated solely by the calibration source, whilst giving access to the meter to read results.



9 LUMINANCE METER CALIBRATION

To the side of the LuxCal250 chamber is housed the LumiCal50 250. A facility is included to allow the insertion of ND filters (ND0.2, 1, 2, 3 and 4 supplied) to perform measurements across the dynamic range. A colour shift filter and modification of lamp current ensures operation at 2856K in accordance with ISO/CIE 19476:2014. A metal tab is provided at the base of the holder to raise filters for removal. The same procedure, raising the tab to gently position the filter should be used. Attention should be paid not to contaminate the filter surface when handling. Please wear gloves.



Level	Filter	Current (A)
	81C	7.5
	81C + ND0.2	7.4
	81C +ND1	7.4
	81C + ND2	7.4
	81C + ND3	7.6
	81C + ND4	8.7

Luminance, unlike illuminance does not depend on distance, but the luminous area of the source must extend beyond the field of view of the luminance meter under consideration.

The reference luminance meter should be used with the tube placed in gentle contact with the output window of the LumiCal50. For each level, the reference luminancemeter should be used to determine the reference luminance values. To measure the DUT, for contact type luminance meters, place the entrance of the luminance meter in contact with the output window of the LumiCal50, for not contact devices, setup the focus and field of view to ensure that the plane of the output window of the LumiCal50 is in focus and under-filled.

For luminance meters with minimum working distance greater than the space available in the LuxCal250 chamber, the LumiCal50 can be removed from the LuxCal250 and set on a bench. A dark room is not strictly required for this measurement although would be a sensible precaution.