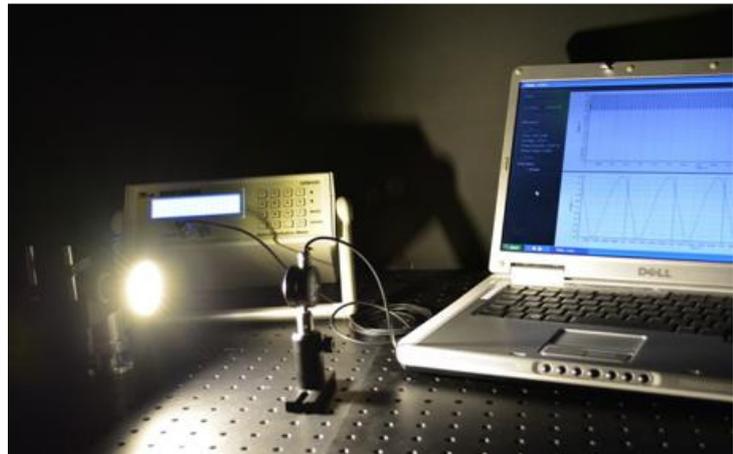




# ORM400\_Flicker

Measurement of

Photometric Flicker



## USER MANUAL

Version 1 – December 2014

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## 1 INTRODUCTION

Thank you for your purchase of the Bentham ORM400\_Flicker for the measurement of photometric flicker of sources employed in lighting. 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 number is 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

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### 5 SYSTEM REQUIREMENTS

Computer with RAM/ performance suitable for desktop applications suitable

Windows 7, Windows 8 (32-/64-bit) operating systems

1x USB- port

1x main socket

Component	Current (220V) (A)	Power consumption (W)
ORM400	<0.1	<10
<b>TOTAL</b>	<b>&lt;0.1</b>	<b>&lt;10</b>

Table 1: Electrical Supply Requirements

## 6 SYSTEM COMPONENTS

1x ORM400 Optical Radiation Meter  
(with power supply)



1x DH400-VL Close Match Photometric Detector



1x Flicker software CD



1x USB Instruments Stingray Oscilloscope



- 2 x USB cables
- 1x BNC cable
- (Computer not supplied)

## 7 HARDWARE & SOFTWARE INSTALLATION



Figure 1:ORM400\_Flicker

The ORM400\_Flicker may be used to measure the photometric flicker of sources under test either by illuminating the photometric detector of the ORM400\_Flicker directly (on a suitable bench in a dark room) or by mounting the photometric detector on a suitable integrating sphere output port.

- 1 Power on the ORM400 using the provided supply and the rear panel switch. Connect by USB to the controlling computer via rear USB port. The hardware will automatically be detected and installed by Windows.

2 Connect the USB Instruments USB oscilloscope to the controlling computer via USB. The hardware will automatically be detected and installed by Windows.

3 Connect the DH400\_VL photometric detector to input 1 of the ORM400 (front panel).



4 Remove the cap from the DH400\_VL photometric detector and install as required.

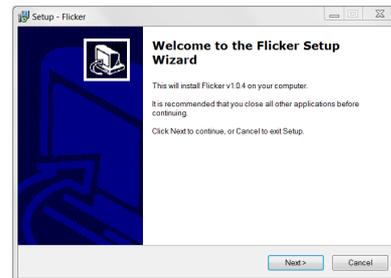
For bench-top use, a M6 threaded radial hole is provided.

5 Connect the ORM400 output port (rear panel) to the oscilloscope input 1 (labelled)

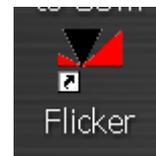
6 Insert the software CD provided into CD drive, and explore to locate Flicker installer folder.

7 Run setup, follow the installation procedure, no intervention required other than hitting “next” and selecting whether or not desktop short cut is sought.

The Flicker program will be installed to C:\Program Files\Bentham\Benwin+ (Program Files x86 for 64-bit OS).



8 Where selected, a desktop short-cut will also be created.



9 The system is now ready to use.

## 8 MEASURING PHOTOMETRIC FLICKER

Photometric flicker is evaluated by temporally resolving photometrically-weighted lamp emission, by the determination of the repeated pattern, and performing calculations thereupon.

The temporal resolved emission is measured by detecting lamp output with a photometric detector, passing the signal through a trans-impedance (current-to-voltage) amplifier (within the ORM400), and measuring the output of which with an oscilloscope.

Percentage flicker is computed from the maximum value, A, and minimum value, B:-

$$\text{Percentage Flicker (\%)} = 100 \cdot \frac{(A - B)}{(A + B)}$$

Flicker index is computed from determining the average signal, then comparing the area, A1, above the average, and the area, A2, below the average:-

$$\text{Flicker Index} = \frac{A1}{(A1 + A2)}$$

These can be viewed graphically in the following:-

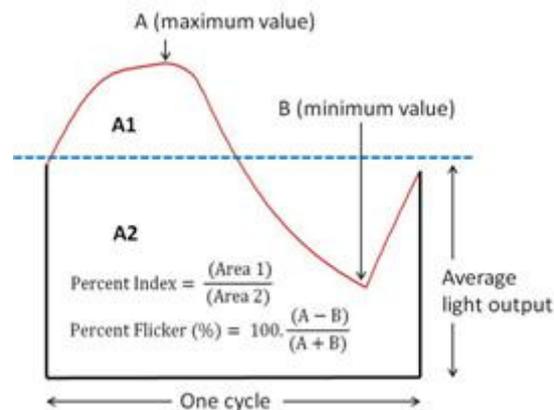
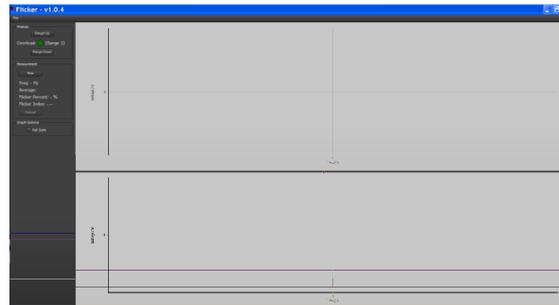


Figure 2: Definition of flicker parameters

Whilst flicker is perceived by the eye, and is strictly defined by time resolved source luminance, absolute units are not important in these relative calculations. Whilst the measurement geometry may be chosen-performing measurements of luminance, total luminous flux or illuminance, the reported values is simply voltage measured by the oscilloscope as a function of time.

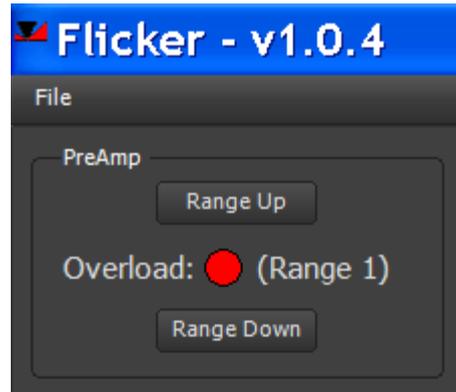
- 1 Power on ORM400, ensure ORM400 and oscilloscope connected to USB.

Run flicker software and power on lamp under test.

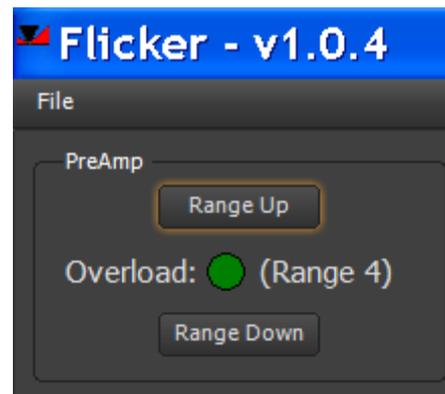


- 2 The amplifier in the ORM400 has six decades of gain, ranging is performed manually.

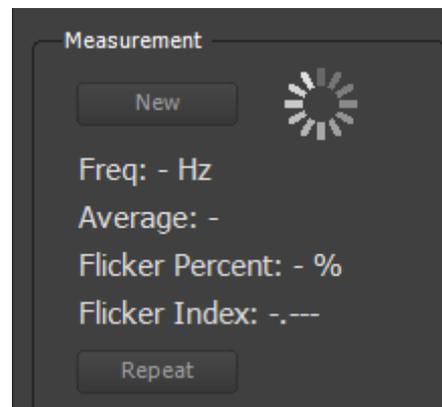
If the red overload flag is shown, hit range up, range- by- range to remove overload.



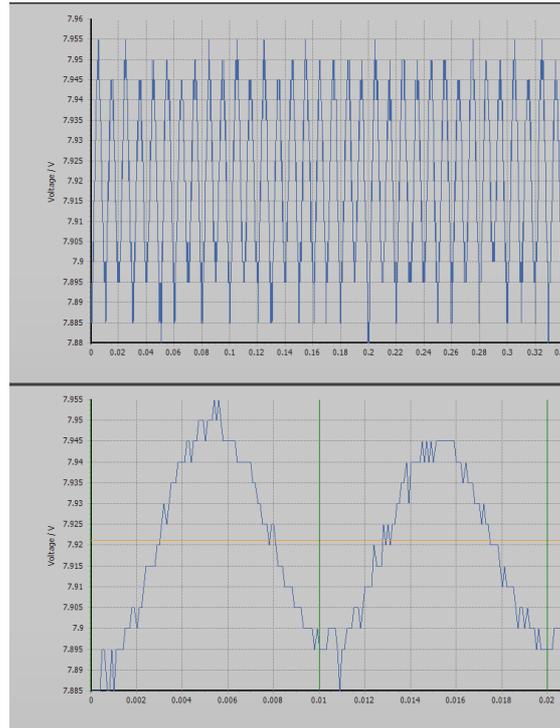
- 3 Stop changing range on the lowest range value that changes the flag to green. In this manner, maximum possible gain is provided.



- 4 When ready, hit "New" in the measurement tab.



- 5 A graphical representation of the evolution of source output as a function of time, lower view zoomed in area.



- 6 Results will be shown in the measurement tab.

Where required, one can repeat the measurement as necessary.

New

Freq: 100.15 Hz  
 Average: 7.92 V  
 Flicker Percent: 0.39 %  
 Flicker Index: 0.001

Repeat

- 7 Where desired, the graphical representation may be set to range the y-axis as full scale rather than around measured value.

Graph Options

Full Scale

- 8 One can export the results to a csv file using files/ export/ Excel (.csv).

The csv file records all calculation results in addition to the raw data of voltage against time.



## 10 TROUBLESHOOTING

The following is a list of some more common problems encountered with FSL300 system, by no means exhaustive. Please contact Bentham should any other problem arise.

Problem	Possible error/ solution
Software does not initialize	✓ Ensure all units are switched on and USB connection OK
On scanning, no signal seen	✓ Ensure DH400_VL is connected to ORM400 input 1 ✓ Ensure ORM400 output connected to oscilloscope input 1 ✓ Ensure lamps are powered on ✓ Ensure amplifier not in overload