CL3 Deuterium Standard of Spectral Irradiance User Notes

Overview

The Bentham CL3 is a spectral irradiance standard, calibrated at a distance of 200mm with respect to the front face of the device. This calibration is traceable to the NPL; please refer to the accompanying certificate for calibration results.

A gap bar is provided to set the correct calibration distance.

Mechanical

In use the output window of the CL3 should be placed on-axis to and at the calibration distance of 200mm from the input optic of the system to be calibrated.

705 Power Supply Operation

It is recommended to operate the CL3 from the Bentham 705 Deuterium lamp power supply.

The 705, on switch on, provides the Deuterium lamp with a controlled application of heater current prior to establishing the arc. The sequence is as follows:-

- 0-65s => 0.9A dc heater current
- 65-90s => 0.8A dc heater current
- > 90s => 0.6A dc heater current
- Anode current 300mA applied

Bentham 705 Deuterium lamp supply

There are three electrical connections between the 705 and the CL3, anode (red), cathode (black) and heater (blue).

On switch-on of the 705, a red LED illuminates; after one minute the discharge is commenced and a green LED illuminates. Should lamp striking fail, the restart sequence be started. Should this occur repeatedly, power off the device and ensure that the electrical connections are properly fitted before

Lamp Operation

For correct lamp operation, and to preserve the validity of calibration, please respect the following:-

- Ensure the correct electrical connections are respected at all times
- Please do not remove bulb from housing nor adjust rear screws
- Do not touch bulb with bare fingers
- Bentham recommend that the device should be re-calibrated every 100hrs use or1-year, whichever comes first
- The lamp requires approximately 20 minutes warm-up time

Precautions

This lamp produces radiation in the UV-C range which is harmful to skin and eyes. Always wear suitable eye protection and avoid exposure of the skin to the emitted radiation.

There is also a small amount of ozone produced by the lamp. Use the lamp in a well ventilated area, avoid long running periods and if possible do not occupy the space where the lamp is being operated during the warm up period.

The Deuterium Lamp

The basic deuterium lamp construction is a cylindrical envelope, typically of natural fused silica or UV glass in which a box electrode structure is formed. The lamp is often formed with a projecting snout in the direction of optical output, thereby distancing the output window from the arc to obviate the effect of condensation of arc vapours.

The electrode box structure, made of high purity nickel, contains the anode, cathode and the arc aperture and forms the front aperture, ensuring only emission from the discharge be transmitted in the output axis, rather than the unstable cathode glow radiation.

In separate compartments of the box structure are a triple oxide cathode, (barium, strontium and calcium mixed oxide), and a anode, typically formed of a flat molybdenum plate.

In operation, a heat supply of a few volts is applied to the cathode to raise its temperature to over 900℃ and thereby commence the thermionic emission of electrons.

The momentary application of a high, strike voltage to the anode (~350V), accelerates the thermionically emitted electrons from the cathode, through the gas, with which the high energy electrons collide.

As a result of the collisions, the deuterium molecules are broken down to D+ ions which migrate toward and collide with the cathode, generating secondary electron emission.

The movement of the relatively larger ions between the electrodes is slow, means that they are left between the electrodes for long periods, which results in the neutralisation of the negative space charge making it possible for a large current to flow.

The envelope is filled with 99.7% pure deuterium gas at a controlled low pressure. Deuterium is chosen as it produces a more intense UV continuum than hydrogen.

When used for long periods, lamps of natural fused silica show a loss of output due the effect of UV, resulting in a loss in transmission. This effect is a result of impurities in the material and is known as solarisation. A window of a solarisation insensitive material is usually employed at the lamp output.

Lamp life is estimated at around 500hrs use.

WEEE statement:

Bentham are fully WEEE compliant, our registration number is WEE/CB0003ZR.
Should you need to dispose of our equipment please telephone 0113 385 4352 or 4356, quoting account number 135419.

Bentham Instruments Limited
2 Boulton Road, Reading, Berkshire, RG2 0NH, UK
Tel: +44 (0)118 975 1355 Fax: +44 (0)118 931 2971
Email: sales@bentham.co.uk Internet: www.bentham.co.uk