

Calibration Certificate

No. 2008-85-2

Calibration Item

Halogen Lamp (1000W)

Manufacturer	Optronic Laboratories
Type	DXW, OL 200A-H
Serial number	IZ03

Customer

Izaña Atmospheric Observatory
OZONE & UV Group
Instituto Nacional de Meteorologia (INM)
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Spain

Calibration Mark

2008-85-2

Date of calibration

21 February, 2008

Davos Dorf, 22 September, 2008

Dr. Gregor Hülsen
In charge of calibration

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Head UV Center

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Calibration procedure

Measurement of the spectral irradiance of the test lamp, $E(\lambda)$, was obtained in the range of 250 to 500 nm, every 1 nm. The irradiance of the test lamp is based on a comparison to the average of five 1000 W transfer standards representing the QASUME irradiance reference.

The radiation emitted by the test lamp was measured by the QASUME¹ spectroradiometer (Gröbner et al., 2005). The receiving area of the detector has a diameter of 10 mm. The measured spectral irradiance was smoothed to a 5 nm wavelength grid.

Calibration condition

Experimental Setup: The calibration of the test lamp was performed in the laboratory of PMOD/WRC. The temperature of the laboratory was $21.9 \pm 0.3^\circ \text{C}$, the humidity $27.2 \pm 1.0\%$. The setup is shown in Figure 1.

Measurement Geometry: The test lamp was mounted in a lamp holder with the filament in a horizontal position. The vertical optical axis passed through the center of the filament with the detector placed below the lamp holder. The test lamp was oriented with the positive polarity (+) to the right when standing in front of the lamp; the glass seal was oriented horizontally towards the lamp holder (away from the observer). The center of the filament, i.e. the lamp reference point, and the center of the diffuser head of the spectroradiometer were positioned through the vertical optical axis using a laser and a water gauge. The distance from the lamp reference point to the reference plane of the QASUME entrance optic was 500 mm.

Lamp current: $8.0000 \pm 0.0005 \text{ A}$
Lamp ramp-up time was 1.6 min, the ramp-down time was 1.6 min and the burn time 23.0 min

Lamp voltage: $117.31 \pm 0.02 \text{ V}$
The voltage was measured with separate wires to the connectors of the lamp holder.

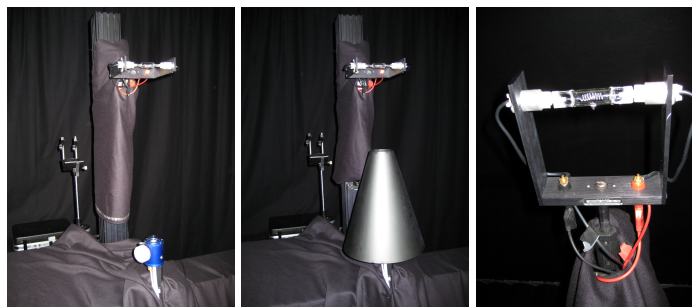


Figure 1: Picture of the test lamp as mounted in the experimental setup.

¹The QASUME spectroradiometer B5503 is made available by the Institute of Health and Consumer Protection of the Joint Research Centre of the European Commission, Ispra, Italy through a collaboration agreement with PMOD/WRC.

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Lamp irradiance $E(\lambda)$ [$\text{mWm}^{-2}\text{nm}^{-1}$]:

λ [nm]	$E(\lambda)$	λ [nm]	$E(\lambda)$	λ [nm]	$E(\lambda)$
250	2.135E-01	340	7.378E+00	430	4.002E+01
255	2.978E-01	345	8.392E+00	435	4.277E+01
260	3.899E-01	350	9.460E+00	440	4.558E+01
265	5.000E-01	355	1.065E+01	445	4.847E+01
270	6.398E-01	360	1.192E+01	450	5.150E+01
275	8.089E-01	365	1.328E+01	455	5.452E+01
280	1.008E+00	370	1.475E+01	460	5.765E+01
285	1.240E+00	375	1.636E+01	465	6.085E+01
290	1.509E+00	380	1.798E+01	470	6.412E+01
295	1.822E+00	385	1.976E+01	475	6.747E+01
300	2.188E+00	390	2.158E+01	480	7.087E+01
305	2.602E+00	395	2.361E+01	485	7.429E+01
310	3.086E+00	400	2.563E+01	490	7.775E+01
315	3.613E+00	405	2.782E+01	495	8.129E+01
320	4.213E+00	410	3.006E+01	500	8.484E+01
325	4.883E+00	415	3.241E+01		
330	5.642E+00	420	3.485E+01		
335	6.472E+00	425	3.738E+01		

Expanded uncertainty of measurement u is 4.5 %.

Expanded uncertainty of measurement u relative to the Q_{ASUME} irradiance reference is 1.0 %.

The reported expanded uncertainty of measurement u is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Comments:

The absolute spectral irradiance is traceable to the primary irradiance standard of the Physikalisch-Technische Bundesanstalt (PTB), Germany, through the transfer standards F300, F304, F324, F330, F376 (Gröbner and Sperfeld, 2005).

References

- J. Gröbner and P. Sperfeld. Direct traceability of the portable Q_{ASUME} irradiance scale to the primary irradiance standard of the PTB. *Metrologia*, 42:134–139, 2005.
- J. Gröbner, J. Schreder, S. Kazadzis, A. F. Bais, M. Blumthaler, P. Görts, R. Tax, T. Koskela, G. Seckmeyer, A. R. Webb, and D. Rembges. Traveling reference spectroradiometer for routine quality assurance of spectral solar ultraviolet irradiance measurements. *Appl. Optics*, 44:5321–5331, 2005.