



S Swiss Calibration Service
C Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
S Servizio svizzero di taratura



Calibration Laboratory accredited by the Swiss Accreditation Service
 Von der Schweizerischen Akkreditierungsstelle akkreditierte Kalibrierstelle
 Laboratoire d'étalonnage accrédité par le service suisse d'accréditation

Accreditation N° **SCS 053**
 Akkreditierungs-Nr.: **SCS 053**
 N° d'accréditation
 accredited according to ISO/IEC 17025

The Swiss Accreditation Service SAS is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates and to the ILAC Mutual Recognition Arrangement (www.sas.ch; www.european-accreditation.org; www.ilac.org)

SCS	KALIBRIERZERTIFIKAT	SCS
CERTIFICAT D' ETALONNAGE		
CERTIFICATE OF CALIBRATION		

Zertifikat Nr. N° de certificat Certificate N°	08205-1	Seite Page Page	von 1 de 3 of
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Auftraggeber Client Customer	CO.FO.ME.GRA Sig. Arturo Bellicoso I-20125 MILANO	Auftrags-Nr., -Datum N° de comm., date Order N°, date
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Gegenstand Objet Object	<i>UV-Radiometer/ Lux-Meter</i>
Typ / Serien Nr Type / N° de serie Model / Serial N°	<i>Multimeter #MUM61</i>
Hersteller, Fabricant Manufacturer	<i>CoFoMeGra</i>
Zubehör Accessoires Accessories	<i>5 sensors: #UV1111, #UV2068, #UV3199, #UV4017, #UV5081(BST)</i>
Bemerkungen Remarques Remarks	<i>Calibrated for irradiation by Xe-lamp in Solarbox (Filter outdoor)</i>
Kalibrierdatum Date d'étalonnage Date of calibration	<i>11.04.2008</i>

Dieses Kalibrierzertifikat dokumentiert die Rückverfolgbarkeit auf nationale Normale zur Darstellung der physikal. Einheiten (SI).
 Ce certificat d'étalonnage confirme le raccordement aux étalons nationaux qui matérialisent les grandeurs physiques (SI).
 This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).

Messresultate, Messunsicherheiten mit Vertrauensbereich und Messverfahren sind auf den folgenden Seiten aufgeführt und Teil dieses Zertifikates
 Les résultats, les incertitudes avec le niveau de confiance et les méthodes de mesure sont donnés aux pages suivantes et font partie du certificat
 The measurements, the uncertainties with confidence probability and the calibration methods are given on the following pages and are part of the certificate

Stempel und Datum
 Timbre et date
 Stamp and date

opto.cal gmbh
SCS-Kalibrierlabor
sur le Bucheté 123
CH-2812 Movelier

11.4.2008

Leiter der Kalibrierstelle
 Chef du laboratoire d'étalonnage
 Head of the Calibration laboratory

Ch. Schroeder
 Ch.Schroeder

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Zertifikat Nr
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08205-1

Multimeter #MUM61

1 CALIBRATION METHOD

The calibration has been executed acc. to SOP 12.04: S(integral)

To establish the calibration of the unit under test (D.U.T.) the irradiance source was measured with an absolute calibrated spectroradiometer. The irradiance in the spectral bands of the detectors under test (340nm, 420nm, 295-400nm) and the illuminance was calculated from these measurements. Then the unit under test was set to measure the same source and the deviation to the reference value was documented.

2 RESULTS OF CALIBRATION

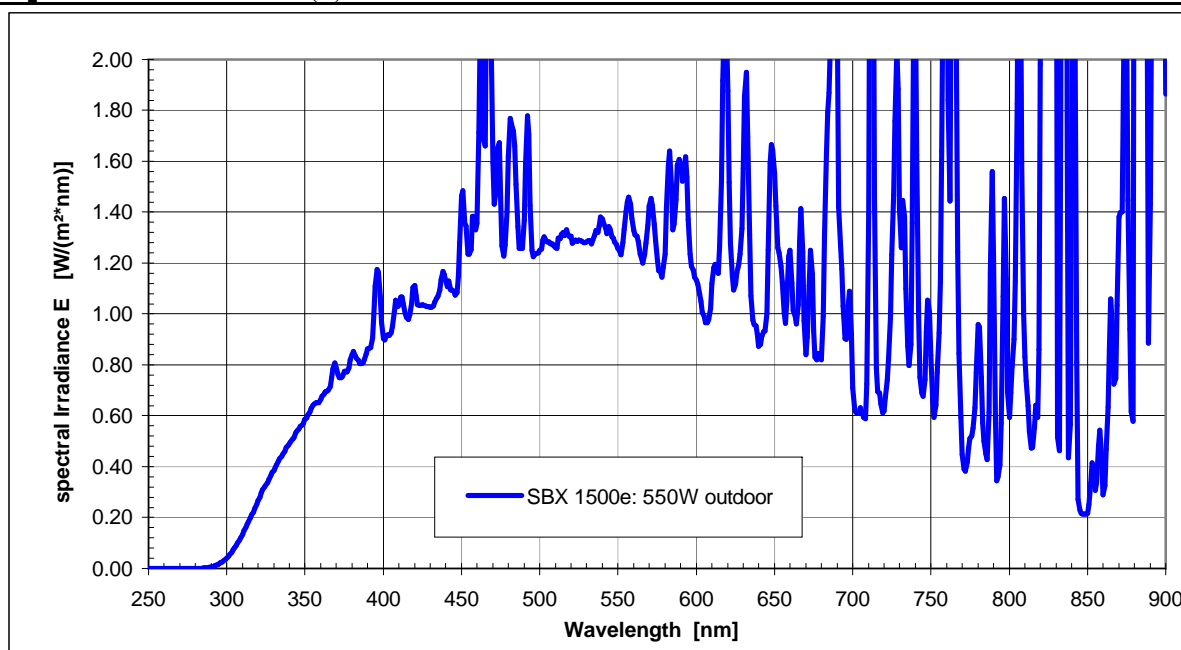
2.1 Measurement of spectral irradiance $E(\lambda)$ and Illuminance E_v

For a spectral distribution as it is emitted by a source of the type Solarbox (see graph §2.2) the following deviation of measurement values for irradiance E in the following wavelength ranges have to be reported:

SENSOR:	340nm #UV1111	295-400nm #UV3199	420nm #UV2068	kLux #UV4017
Reference ± measurement uncertain	0.489 ± 0.03	55.7 ± 3.9	1.109 ± 0.08	96.5 ± 3.86
Display D.U.T. :	0.517 ± 0.005	54.9 ± 0.5	1.144 ± 0.007	98 ± 1
Unit :	W/m ² /nm	W/m ²	W/m ² /nm	klx
Deviation:	5.7%	-1.4%	3.2%	1.5%
Calibration factor ±uncertainty :	0.95 ± 0.07	1.01 ± 0.07	0.97 ± 0.07	0.99 ± 0.04

The instrument has not been adjusted, calibration factors may be applied.

2.2 Spectral distribution $E(\lambda)$ of test source



* The SCS-Accreditation covers the wavelength range 300 to 1100nm. Measurements with $\lambda < 300\text{nm}$ and $\lambda > 1100\text{nm}$ are outside of the accredited range of the calibration laboratory and may therefore not be considered as SCS-calibration values, although measurement methods and QM-system are identical to official SCS-calibrations

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3 UNCERTAINTY OF CALIBRATION

relative measurement uncertainty of measurand in wavelength range	
± 7 %	300 - <400nm
± 4 %	400 - 800nm

The reported expanded uncertainty of measurement 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 %.

The uncertainty includes the contributions to uncertainty by the standards, procedures, environmental conditions and unit under test at the moment of calibration. The long term behaviour was not taken into consideration.

± 0.5 nm Uncertainty of wavelength scale

The influence of the directional response (deviation from the cosine of incidence angle, "cosine error") at other measurement geometries and the match of spectral sensitivity for measurement of other sources has not been taken into account.

4 CALIBRATION and MEASUREMENT CONDITIONS

Measuring geometry on Solarbox sample tray
Reference plane = sample tray (bottom of sensor)

Test source: Solarbox 1500e sn0703150
working conditions: Filter outdoor, 550W/m²

Temperature/Climate: Raumtemperatur: 22°C ± 1°C rel.Feuchte: 45%rH ± 10%rH Temp. Prüfobjekt: --

Measuring Instruments: Spektroradiometer #B-02 (Instrument Systems SP320D): Scanning double mono (Step 1nm, FWHM 2.5nm) / Kugel nm23(Ø4",A=1cm²) / ofg425(B-02d)
Transfornormal #B-14 (HL760) + DMM #A-24 (Metrahit 28s) + Detektor #D-56
Lux-Normal #B-17 / #T-06(BST-Thermometer) + DMM #A-24 (Metrahit 28s) / DKD-K-19701 #B0159-05-07 /

5 TRACEABILITY

Reference standard(s) : Spektroradiometer #B-02: SP320D/250-1100nm/step1nm/FWHM2.5nm
internally calibrated with
Strahlungsnormal FEL 1000 W, sn OS101 (#A-13) / Metas #116-0097 / Cal.due 3.2009
Hg-/Ar-Spektrallinienstrahler #A-08
Hg - Thermometer Hediger, sn 2001-9004 (#A-07) / SCS011 #3587 / Cal.due 5.2011

6 RAW DATA

The raw data are archived for 10 years at least.

Directory: 08-mess

7 APPENDIX: Calibration of temperature probe

Thermometric calibration is not subject of calibration laboratory accreditation by the Swiss Calibration Service.
The thermometric measurements are conducted under ISO17025 quality management system, traceability is given with SCS-calibrated thermometer

7.1 Black Standard Temperature (BST)

Reference ± measurement	Display	Deviation		Reference ± measurement	Display	Deviation	
20.4 ± 0.2	20.4	0.0	°C	40.2 ± 0.2	40.1	-0.1	°C
29.0 ± 0.2	29.0	0.0	°C	50.3 ± 0.2	50.2	-0.1	°C

The deviation D.U.T to reference are within typical tolerance of black standard thermometers.

7.2 Traceability

reference standards: Hg - Thermometer Hediger, sn 2001-9004 (#A-07) / SCS011 #3587 / Cal.due 5.2011

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