

Certificate of Calibration

Calibration of:	SOUND CALIBRATOR
Manufacturer:	GENRAD
Model number:	1987 MINICAL
Serial number:	9176686002
Calibrated for:	BUSINESS ENTERPRISES AT UNIVERSITY OF PRETORIA Pretoria
Calibration procedure:	AVAS-0008
Period of calibration:	28 September 2011

1 PROCEDURE

The sound calibrator was calibrated by comparison with a known reference sound source.

The results of the measurements are traceable to the national measurement standards.

The following equipment was used:


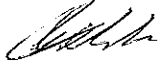

Brüel & Kjær 2673 preamplifier	(AS-59)
MadgeTech PRHTemp2000	(AS-106)
Brüel & Kjær 3630 Calibration platform	(AS-109)
Brüel & Kjær 4136 ¼" Pressure Microphone	(AS-WS-05)
Brüel & Kjær 4228 Pistonphone	(AS-WS-14)

2 RESULTS

2.1 The sound calibrator's sound pressure levels were found to be:

UUT Nominal Frequency (Hz)	UUT SPL Setting (dB)	UUT L_p (dB re 20 µPa)	L_p Uncertainty (dB)
1 000	94	93,20 1	0,20
1 000	114	113,18 2	0,20

1 2 see Remarks 3.6

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Conditions under which the NMISA will perform work

In this document, reference to a service or services will include: calibration, measurement, analysis or conformance work performed by NMISA on behalf of the Applicant.

1. The NMISA is empowered by the Measurement Unit and Measurement Standards Act, Act No. 18 of 2006.
2. Services are carried out at the discretion of the NMISA, which reserves the right to decline any application for performance of services when deemed to be outside the scope of services of the NMISA.
3. Through acceptance of the original quotation, the Applicant agrees to the quoted fee and the conditions stated herein. In cases where the NMISA has not published the amount of the fee, the NMISA will in good faith give estimates of the time and cost of the service based upon its previous experience.
4. Payment is strictly 30 days from the date of invoice; or as mutually agreed in writing between the Applicant and the NMISA before the service commenced. The NMISA retains the right to ask for a deposit for international services.
5. Regarding certificates and reports:
 - a. A certificate or report, as appropriate, will be furnished to the Applicant on completion of the service;
 - b. Reports or certificates may be freely published by the Applicant provided that such publication is verbatim and in full;
 - c. The NMISA reserves the right after the termination of a period of one year or any period agreed upon, to publish or report in whole or in part together with any comments or additional matter which is considered desirable but will not in general expect to exercise that right except as regards service results deemed to be of general interest;
 - d. Additional certified copies of certificates or reports, or re-issued certificates or reports will be subject to an additional fee, as determined on a case by case basis.
6. All gauges, instruments, items of equipment, etc. sent by the Applicant for performance of services at the NMISA shall be delivered and collected at the Applicant's own cost and risk.
7. The NMISA cannot guarantee to complete the work within the estimated time and cost but will consult the Applicant if it becomes apparent that either estimate will be exceeded.
8. If a service is not completed because of defects or deficiencies in the item submitted by the applicant, an appropriate reduction in the fee may be allowed depending on the amount of work already performed. The normal practice will be to charge the fee in full.
9. The Applicant hereby consents that the legal liability of the NMISA with regard to any damage whatsoever or a mistake made by the NMISA in services performed for the Applicant will be limited to the original quoted fee.

VALIDITY OF CALIBRATION

The values in this certificate are correct at the time of the calibration. Subsequently the accuracy will depend on such factors as the care exercised in handling and use of the instrument and the frequency of its use. Recalibration should be performed after a period which has been chosen to ensure that the instrument's accuracy remains within the desired limits.

2.2 The sound calibrator's frequencies were found to be:

UUT Nominal Frequency (Hz)	UUT SPL Setting (dB)	UUT Frequency (Hz)	Frequency Uncertainty (Hz)
1 000	94	1 000,05	0,10
1 000	114	997,93	0,10




2.3 The sound calibrator's total harmonic distortion levels were found to be:

UUT Nominal Frequency (Hz)	UUT SPL Setting (dB)	UUT THD (%)	THD Uncertainty (%)
1 000	94	1,25	0,13
1 000	114	1,29	0,13

3 REMARKS

- 3.1 The reported uncertainties of measurement were calculated and expressed in accordance with the BIPM, IEC, ISO, IUPAP, OIML document entitled "A Guide to the Expression of Uncertainty in Measurement" (International Organisation for Standardisation, Geneva, Switzerland, 1993).
- 3.2 The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by a coverage factor of $k=2$, which for a normal distribution approximates a level of confidence of 95,45%.
- 3.3 Certain of the NMISA certificates are consistent with the capabilities that are included in appendix C of the MRA (Mutual Recognition Arrangement) drawn up by the CIPM. Under the MRA, all participating institutes recognise the validity of each other's calibration and measurement certificates for the quantities and ranges and measurement uncertainties specified in Appendix C. For details see <http://www.bipm.org>.
- 3.4 The calibrations were carried out at an ambient temperature of $23\text{ °C} \pm 2\text{ °C}$ and a relative humidity of $50\text{ \%RH} \pm 20\text{ \%RH}$.
- 3.5 Only the parameters in 2.1, 2.2 and 2.3 were calibrated.
- 3.6 **Ⓢ** The measurement results for the UUT were not corrected to a reference static pressure and a reference temperature and no volume corrections were applied. The measurement results were valid for a static pressure of 86,5 kPa and a temperature of 24,1 °C.

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