

Product Information

Danish Primary Laboratory of Acoustics Accredited Calibration of Microphones — ET2012 to ET2016

USES:

- Acoustic calibration of microphones to international standards

FEATURES:

- Fulfils ISO 9000 requirements

- All test signals comply with IEC 1094-1
- Calibrations are traceable to National Institute of Standards and Technology (NIST), USA
- Printed certificate of calibration specifying which tests were performed
- All test procedures fully comply with European Norm EN 45001

The Danish Primary Laboratory of Acoustics (DPLA) offers accredited calibration of microphones which serve as Reference Standards and Working Standards for measurement laboratories and other users within the field of acoustics.

Absolute calibrations that have been made at the DPLA are compared with standards from leading primary laboratories all over the world. This is to ensure present, and improve future agreement between calibrations from different laboratories.



Introduction

The Danish Primary Laboratory of Acoustics has been active in research on fundamental acoustics and calibration of microphones at the highest international level. The laboratory has taken part in several international calibration projects (under BCR, EUROMET and IEC), and members of our staff have chaired many of the standardization working groups within IEC and ISO.

Calibration of Laboratory Standard Microphones

The reciprocity calibration method described in IEC 1094-2 is used to determine the pressure sensitivity of the microphone.

The method requires three reciprocal microphones. One of the microphones is always a DPLA Reference Microphone with known sensitivity. The microphones are used pair-wise as a sound source and as a receiver. In the calibration set-up they are coupled together via the air inside a small cavity.

The three transfer impedances (receiver output voltage divided by transmitter input current) are measured and are used to calculate the sensitivities of the three microphones that are being calibrated.

The reproducibility of the measurements is better than 0.01 dB and the 95% confidence level ranges from 0.03 dB to about 0.40 dB depending on microphone type and frequency.

All calibrations are performed in the range 30 Hz to 25 kHz.

Specifications ET2012 to ET2016

Measured Quantity	Measurement Range ^①	Measurement Capability, U ₉₅ ^②	Method	Procedure ^③	Remarks
Pressure sensitivity of laboratory standard microphones. dB re 1 V/Pa	-26 dB±2 dB re 1 V/Pa (200 — 500 Hz) for Type LS1Pn (1") IEC 1094-1	31.5 Hz: ±0.06 dB 63 Hz: ±0.04 dB 125 Hz: ±0.03 dB 4000 Hz: ±0.03 dB 5000 Hz: ±0.04 dB 6300 Hz: ±0.05 dB 8000 Hz: ±0.06 dB 10000 Hz: ±0.12 dB	IEC 1094-2 Primary method for pressure calibration of laboratory standard microphones by the reciprocity technique		Brüel & Kjær Microphone Type 4160 (1")
		31.5 Hz: ±0.08 dB 63 Hz: ±0.06 dB 125 Hz: ±0.05 dB 250 Hz: ±0.04 dB 3150 Hz: ±0.04 dB 4000 Hz: ±0.05 dB 5000 Hz: ±0.06 dB 6300 Hz: ±0.08 dB 8000 Hz: ±0.10 dB			Brüel & Kjær Microphone Type 4144 with Adaptor Ring DB 0111 (1") (Brüel & Kjær Microphone Type 4145 with Adaptor Ring DB 0111 (1"))
	-37 dB±3 dB re 1 V/Pa (200 — 500 Hz) for Type LS2aP (1/2") IEC 1094-1	31.5 Hz: ±0.08 dB 63 Hz: ±0.05 dB 125 Hz: ±0.04 dB 8000 Hz: ±0.04 dB 10000 Hz: ±0.05 dB 12500 Hz: ±0.06 dB 16000 Hz: ±0.08 dB 20000 Hz: ±0.12 dB 25000 Hz: ±0.30 dB			Brüel & Kjær Microphone Type 4180 (1/2")
		31.5 Hz: ±0.10 dB 63 Hz: ±0.07 dB 125 Hz: ±0.06 dB 250 Hz: ±0.05 dB 6300 Hz: ±0.05 dB 8000 Hz: ±0.06 dB 10000 Hz: ±0.07 dB 12500 Hz: ±0.08 dB 16000 Hz: ±0.10 dB 20000 Hz: ±0.15 dB 25000 Hz: ±0.40 dB			Brüel & Kjær Microphone Type 4133 with permanently mounted Adaptor Ring UA 0825 (1/2") Brüel & Kjær Microphone Type 4134 with permanently mounted Adaptor Ring UA 0825 (1/2")

^① IEC 1094-1 specifications for laboratory standard microphones

^② Intermediate values are obtained by interpolation

^③ Measurement conditions: 101.3 kPa±2.5 kPa, 23 °C+2 °C-0 °C, 50% RH±20% RH

Ordering Information

Type of Microphone Calibration	Calibration Frequency Series	Specification
ET2012	A	125, 250, 500, 1000, 2000 Hz
ET2013	B	Octave frequencies between 31.5 Hz and the highest frequency stated for the type of microphone in the above table
ET2014	C	Same as Series B but with third octave frequencies above 1 kHz
ET2015	D	Individually selected frequency. Only in addition to series A, B or C
ET2016	Length of Front Cavity	This type of calibration is necessary to perform the above calibrations within the specified uncertainties. It does not need to be performed as frequently as sensitivity calibrations; proposed interval is 5 years

Note: The generally applied calibration frequencies are Nominal Frequencies. The Exact Frequencies are in accordance with ISO 266 and equal to $10^{n/10}$ Hz, where n is an integer.

Brüel & Kjær reserves the right to change specifications and accessories without notice



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