



DFM

Danish National Metrology Institute

ACOUSTIC CALIBRATIONS



MEASUREMENTS AND ACCREDITATION

The acoustics lab at DFM has over 25 years of experience with acoustic calibration and measurements. We provide traceability to companies and laboratories all over the world.

All our standard calibration services are under DANAK accreditation, reg. no. 255, and are carried out under DFM's quality assurance system, certified under ISO 9001.

CALIBRATIONS

DFM provide a wide range of acoustic calibration

services. Some of the standard services we provide within acoustics are the following:

- Microphone, free-field, reciprocity, LS1 / LS2
- Microphone, pressure, reciprocity, LS1 / LS2
- Microphone, free-field comparison (LS1, LS2, WS1 or WS2)
- Microphone, pressure comparison (LS1, LS2, WS1 or WS2)
- Microphone, HF-calibration, free-field reciprocity WS3
- Microphone, HF-calibration, free-field comparison WS3
- Actuator response (LS1, LS2, WS1 or WS2)
- Actuator response, HF to 100 kHz
- Pistonphone calibration
- Calibration of sound calibrator



DANAK

CAL Reg. Nr. 255



PRODUCT DATASHEET rev#_2021-03-22
ACOUSTICS

MEASUREMENT CAPABILITY (CMC)

Quantity	Range	Uncertainty (k=2)	Remarks
Free field sensitivity, modulus	-36 dB to -18 dB	0,07 dB	>1kHz: IEC 61094-3. <1kHz: IEC 61094-3, IEC 61094-2, including differences between free-field and pressure sensitivity. Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4160, similar to type LS1P microphones (IEC 61094-1), 250 Hz <= freq. <= 15 kHz
Free field sensitivity, modulus	-36 dB to -18 dB	0,08 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4160 corresponding to LS1P microphones (IEC 61094-1), 15,1 kHz <= frequency <= 18 kHz
Free field sensitivity, modulus	-36 dB to -18 dB	0,09 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4160 corresponding to LS1P microphones (IEC 61094-1), 18,1 kHz <= frequency <= 21 kHz
Free field sensitivity, modulus	-40 dB to -28 dB	0,07 dB	>3kHz: IEC 61094-3. <3kHz: IEC 61094-3, IEC 61094-2, including differences between free-field and pressure sensitivity. Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4180 similar to LS2aP microphones (IEC 61094-1), 250 Hz <= frequency <= 9.98 kHz
Free field sensitivity, modulus	-40 dB to -28 dB	0,08 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4180 corresponding to LS2aP microphones (IEC 61094-1), 10 kHz <= frequency <= 17.9 kHz
Free field sensitivity, modulus	-40 dB to -28 dB	0,09 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4180 corresponding to LS2aP microphones (IEC 61094-1), 18 kHz <= frequency <= 23.9 kHz
Free field sensitivity, modulus	-40 dB to -28 dB	0,1 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4180 corresponding to LS2aP microphones (IEC 61094-1), 24 kHz <= frequency <= 29.9 kHz
Free field sensitivity, modulus	-40 dB to -28 dB	0,12 dB	Unit in dB relative to 1 V/Pa, Brüel & Kjær Type 4180 corresponding to LS2aP microphones (IEC 61094-1), 30 kHz <= frequency <= 32 kHz
Free field sensitivity, modulus	-40 dB to -10 dB	0,13 dB	Unit in dB relative to 1 V/Pa, WS1 and LS1 microphones (IEC 61094-4), 250 Hz <= frequency <= 500 Hz
Free field sensitivity, modulus	-40 dB to -10 dB	0,12 dB	Unit in dB relative to 1 V/Pa, WS1 and LS1 microphones (IEC 61094-4), 500 Hz < frequency <= 15 kHz
Free field sensitivity, modulus	-40 dB to -10 dB	0,14 dB	Unit in dB relative to 1 V/Pa, WS1 and LS1 microphones (IEC 61094-4), 15.01 kHz <= frequency <= 25 kHz
Free field sensitivity, modulus	-60 dB to -20 dB	0,2 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 250 Hz <= frequency < 500 Hz
Free field sensitivity, modulus	-60 dB to -20 dB	0,15 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 500 Hz <= frequency < 1 kHz
Free field sensitivity, modulus	-60 dB to -20 dB	0,11 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 1 kHz <= frequency <= 15 kHz
Free field sensitivity, modulus	-60 dB to -20 dB	0,12 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 15.01 kHz <= frequency <= 20 kHz
Free field sensitivity, modulus	-60 dB to -20 dB	0,13 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 20.01 kHz <= frequency <= 25 kHz
Free field sensitivity, modulus	-60 dB to -20 dB	0,15 dB	Unit in dB relative to 1 V/Pa, WS2, WS3 and LS2 microphones (IEC 61094-4), 25.01 kHz <= frequency <= 30 kHz
Free field sensitivity, modulus	-70 dB to -20 dB	0,25 dB to 0,14 dB	IEC 61094-4 Type WS3, dB relative to 1V/Pa, 20 kHz <= frequency <= 150 kHz
Free field sensitivity, modulus	-70 dB to -20 dB	0,3 dB to 0,18 dB	IEC 61094-4 Type WS3, dB relative to 1V/Pa, 20 kHz <= frequency <= 150 kHz
Pressure sensitivity	-40 dB to -20 dB	0,3 dB to 0,11 dB	Unit in dB relative to 1 V/Pa, LS1 microphone, 2 Hz <= frequency <= 12.5 kHz
Pressure sensitivity	-50 dB to -26 dB	0,3 dB to 0,17 dB	Unit in dB relative to 1 V/Pa, LS2 microphone, 2 Hz <= frequency <= 31.5 kHz

Quantity	Range	Uncertainty (k=2)	Remarks
Pressure sensitivity, phase	-180° to 180°	0,06° to 0,56°	LS1 microphone, 2 Hz <= frequency <= 12.5 kHz
Pressure sensitivity, phase	-180° to 180°	0,06° to 1,42°	LS2 microphone, 2 Hz <= frequency <= 31.5 kHz
Pressure sensitivity	-40 dB to -10 dB	0,05 dB to 0,24 dB	WS1, WS2, WS3 microphones (IEC 61094-4) 2 Hz <= frequency <= 31,5 kHz
Pressure sensitivity, phase	-180° to 180°	0,06° to 2°	WS1, WS2, WS3 microphones (IEC 61094-4) 2 Hz <= frequency <= 31,5 kHz
Actuator response, modulus	-20 dB to 10 dB	0 dB to 0,5 dB	WS1, WS2, WS3 microphones 2 Hz <= frequency <= 100 kHz
Actuator response, phase	-180° to 180°	0° to 2°	WS1, WS2, WS3 microphones 2 Hz <= frequency <= 100 kHz
Sound pressure level	124 dB	0,05 dB	124 dB re 20 µPa
Sound pressure level	94 dB to 124 dB	0,07 dB to 0,1 dB	Including multifrequency calibrators from 20 Hz to 16 kHz. dB re 20 µPa
Acoustic transfer impedance	100 dB to 200 dB	0,2 dB to 0,3 dB	Including types IEC 60318-1 and IEC 60318-4, from 20 Hz to 16 kHz, dB re 1 Pa s-1 m ³

SERVICES

DFM offers other services besides calibrations. We can offer the following services:

- Custom measurements
- Characterization of equipment, samples, etc.
- Review of measurement methods, procedures and setups
- Development of custom calibration methods or measurement setups

For more details about our services, please visit www.dfm.dk or www.dfm-metrology.com

ABOUT DFM

DFM is Denmark's National Metrology Institute (NMI). DFM is a signatory to the CIPM-MRA arrangement that ensures mutual recognition of measurements worldwide

TRACEABILITY

All measurements are traceable to recognized national and international standards.

ISO CERTIFICATION

All services are covered by DFM's ISO 9001 certification

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