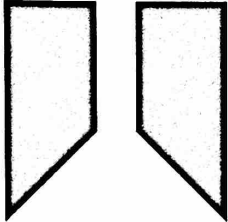


CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc

DATE OF ISSUE 09 December 2020

CERTIFICATE NUMBER 149946



Cirrus Research plc
Acoustic House
Bridlington Road
Hunmanby
North Yorkshire
YO14 0PH
United Kingdom

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Approved signatory

S. Doveton

Electronically signed:

Sound Level Meter : IEC 61672-3:2013

Instrument information

Manufacturer:	Cirrus Research plc	Notes:
Model:	CR:152B	
Serial number:	G071462	
Class:	2	
Firmware version:	3.2.2690	

Test summary

Date of calibration: 08 December 2020

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.
Periodic tests were performed in accordance with procedures from IEC 61672-3:2013.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to determine that the model of sound level meter fully conformed to the class 2 specifications in IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:
149946

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Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 99.37 kPa Temperature: 23.2 °C Humidity: 38.2 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Signal Generator	TTi	TGA1241	419342
Attenuator	Cirrus Research	ZE:952	64370
Environmental Monitor	Comet	T7510	16966334

Additional instrument information

Instruction manual:

Reference level range: Single range

Pattern approval: No

Source of pattern approval: -

Pre-amplifier

Model: MV:200F

Serial number: 4861F

Microphone

Model: MK:216

Serial number: 406429B

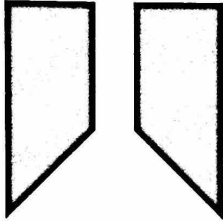
Test results summary

Test	Result
Toneburst response	Complies
Electrical noise-floor	Complies
Linearity	Complies
Frequency weightings	Complies
Frequency and time weightings at 1 kHz	Complies
High level stability	Complies
Long-term stability	Complies

CERTIFICATE OF CALIBRATION

ISSUED BY **Cirrus Research plc**

DATE OF ISSUE **09 December 2020** CERTIFICATE NUMBER **149948**



**Cirrus Research plc
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Bridlington Road
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North Yorkshire
YO14 0PH
United Kingdom**

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Approved signatory
S.Doveton
Electronically signed:

Sound Calibrator : IEC 60942:2003

Instrument information

Manufacturer: Cirrus Research plc

Notes:

Model: CR:514

Serial number: 75667

Class: 2

Test summary

Date of calibration: 09 December 2020

The sound calibrator detailed above has been calibrated to the published data as described in the operating manual and in the half-inch configuration. The procedures and techniques used are as described in IEC 60942:2003 Annex B – Periodic Tests and three determinations of the sound pressure level, frequency and total distortion were made.

The sound pressure level was measured using a WS2F condenser microphone type MK:224 manufactured by Cirrus Research plc.

The results have been corrected to the reference pressure of 101.33 kPa using the manufacturer's data.

The manufacturer's product information indicates that this model of sound calibrator has been formally pattern approved to IEC 60942:2003 Annex A to Class 2. This has been confirmed with the Physikalisch-Technische Bundesanstalt (PTB).

As public evidence was available, from a testing organisation responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the Class 2 requirements of IEC 60942:2003.

Notes:

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

Certificate Number:

149948

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Environmental conditions

The following conditions were recorded at the time of the test:

Pressure: 99.70 kPa

Temperature: 22.9 °C

Humidity: 36.0 %

Test equipment

Equipment	Manufacturer	Model	Serial number
Acoustic Calibrator	Bruel and Kjaer	4231	2610257
Distortion Meter	Keithley	2015	1113728
Multimeter	Fluke	8845A	1498004

Initial Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Limits	Uncertainty
Level (dB)	94.00	93.93	93.93	93.94	93.93	-0.07	±0.75	0.11 dB
Distortion (%)	< 4.00	0.31	0.31	0.31	0.31	0.31	+4.00	0.13 %
Frequency (Hz)	1000.0	1000.3	1000.3	1000.3	1000.3	0.3	±20.0	0.1 Hz

The measured quantities or deviations (as applicable), extended by the expanded combined uncertainty of measurement, must not exceed the corresponding tolerance.

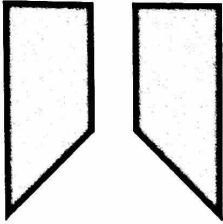
Adjusted Results

	Expected	Sample 1	Sample 2	Sample 3	Average	Deviation	Limits	Uncertainty
Level (dB)	94.00	94.00	94.00	94.01	94.00	0.00	±0.75	0.11 dB
Distortion (%)	< 4.00	0.31	0.31	0.31	0.31	0.31	+4.00	0.13 %
Frequency (Hz)	1000.0	1000.3	1000.3	1000.3	1000.3	0.3	±20.0	0.1 Hz

End of results

CERTIFICATE OF CALIBRATION

ISSUED BY Cirrus Research plc
DATE OF ISSUE 09/12/20 CERTIFICATE NUMBER 149949



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United Kingdom

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Test engineer:
D.Swalwell
Electronically signed:

Microphone

Microphone capsule

Manufacturer: Cirrus Research plc
Model: MK:216
Serial Number: 406429B

Calibration procedure

Date of calibration: 07 December 2020
Open circuit: 38.3 mV/Pa
Sensitivity at 1 kHz: -28.3 dB rel 1 V/Pa

The microphone capsule detailed above has been calibrated to the published data as described in the operating manual of the associated sound level meter (where applicable).

The frequency response was measured using an electrostatic actuator in accordance with BS EN 61094-6:2005 with the free-field response derived via standard correction data traceable to a National Measurement Institute.

The absolute sensitivity at 1 kHz was measured using an acoustic calibrator conforming to IEC 60942:2003 Class 1.

Environmental conditions

Pressure: 99.00 kPa
Temperature: 20.0 °C
Humidity: 32.0 %

CERTIFICATE OF CALIBRATION

Certificate Number:
149949

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Free-Field Frequency Response : Tabular

Frequency (Hz)	Free-Field Sensitivity (dB rel 1 kHz)	Actuator Response (dB)
63	0.80	0.55
80	0.69	0.54
100	0.57	0.48
125	0.43	0.39
160	0.31	0.28
200	0.20	0.19
250	0.12	0.12
315	0.08	0.06
400	0.02	0.02
500	0.00	-0.01
630	-0.01	-0.02
800	-0.01	-0.03
1 000	0.00	-0.03
1 250	0.04	-0.01
1 600	0.12	0.01
2 000	0.24	0.04
2 500	0.39	0.09
3 150	0.64	0.14
4 000	1.02	0.20
5 000	1.43	0.17
6 300	1.85	-0.11
8 000	1.90	-1.18
10 000	1.23	-3.47
12 500	0.59	-5.92
16 000	-1.51	-9.47
20 000	-4.33	-13.39

Free-Field Frequency Response : Graphical

