

ANEXO 3: CERTIFICADOS DE CALIBRACIÓN PARA EQUIPOS DE MEDICIÓN

Calibration Certificate

Certificate Number 2022005729

Customer:

Inspecciones Ambientales Semam SpA
Avda Pajaritos 3195
Piso 15
Santiago, Chile

Model Number LxT2
Serial Number 0006704
Test Results **Pass**
Initial Condition As Manufactured
Description SoundTrack LxT Class 2
Class 2 Sound Level Meter
Firmware Revision: 2.404

Procedure Number D0001.8384
Technician Jacob Cannon
Calibration Date 3 May 2022
Calibration Due 3 May 2024
Temperature 23.54 °C ± 0.25 °C
Humidity 51.2 %RH ± 2.0 %RH
Static Pressure 85.91 kPa ± 0.13 kPa

Evaluation Method **Tested with:** **Data reported in dB re 20 µPa.**

Larson Davis PRMLxT2C, S/N 071576
Larson Davis CAL291, S/N 0108
Larson Davis CAL200, S/N 9079
PCB 375A04, S/N 338866

Compliance Standards Compliant to Manufacturer Specifications and the following standards when combined with Calibration Certificate from procedure D0001.8378:

IEC 60651:2001 Type 2	ANSI S1.4-2014 Class 2
IEC 60804:2000 Type 2	ANSI S1.4 (R2006) Type 2
IEC 61252:2002	ANSI S1.11 (R2009) Class 2
IEC 61260:2001 Class 2	ANSI S1.25 (R2007)
IEC 61672:2013 Class 2	ANSI S1.43 (R2007) Type 2

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017.

Test points marked with a ‡ in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Correction data from Larson Davis LxT Manual for SoundTrack LxT & SoundExpert Lxt, 1770.01 Rev J Supporting Firmware Version 2.301, 2015-04-30

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Certificate Number 2022005729

For 1/4" microphones, the Larson Davis ADP024 1/4" to 1/2" adaptor is used with the calibrators and the Larson Davis ADP043 1/4" to 1/2" adaptor is used with the preamplifier.

Calibration Check Frequency: 1000 Hz; Reference Sound Pressure Level: 114 dB re 20 µPa

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part3.

No Pattern approval for IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 available.

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3:2013 / ANSI/ASA S1.4-2014/Part 3, 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 / ANSI/ASA S1.4-2014/Part 1 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 2 specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1 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 / ANSI/ASA S1.4-2014/Part 3 cover only a limited subset of the specifications in IEC 61672-1:2013 / ANSI/ASA S1.4-2014/Part 1.

Standards Used				
Description	Cal Date	Cal Due	Cal Standard	
Larson Davis CAL291 Residual Intensity Calibrator	2021-09-10	2022-09-10	001250	
Hart Scientific 2626-H Temperature Probe	2021-02-04	2022-08-04	006767	
Larson Davis CAL200 Acoustic Calibrator	2021-07-21	2022-07-21	007027	
Larson Davis Model 831	2022-02-21	2023-02-21	007182	
PCB 377A13 1/2 inch Prepolarized Pressure Microphone	2022-03-02	2023-03-02	007185	
SRS DS360 Ultra Low Distortion Generator	2022-03-29	2023-03-29	007635	
Larson Davis 1/2" Preamplifier for Model 831 Type I	2021-09-28	2022-09-28	PCB0004783	

Acoustic Calibration

Measured according to IEC 61672-3:2013 10 and ANSI S1.4-2014 Part 3: 10

Measurement	Test Result [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
1000 Hz	114.00	113.80	114.20	0.14	Pass

Loaded Circuit Sensitivity

Measurement	Test Result [dB re 1 V / Pa]	Lower Limit [dB re 1 V / Pa]	Upper Limit [dB re 1 V / Pa]	Expanded Uncertainty [dB]	Result
1000 Hz	-49.86	-52.44	-48.33	0.14	Pass

-- End of measurement results--

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Acoustic Signal Tests, C-weighting

Measured according to IEC 61672-3:2013 12 and ANSI S1.4-2014 Part 3: 12 using a comparison coupler with Unit Under Test (UUT) and reference SLM using slow time-weighted sound level for compliance to IEC 61672-1:2013 5.5; ANSI S1.4-2014 Part 1: 5.5

Frequency [Hz]	Test Result [dB]	Expected [dB]	Lower Limit [dB]	Upper Limit [dB]	Expanded Uncertainty [dB]	Result
125	-0.20	-0.20	-1.70	1.30	0.23	Pass
1000	0.15	0.00	-1.00	1.00	0.23	Pass
8000	-3.59	-3.00	-8.00	2.00	0.32	Pass

-- End of measurement results--

Self-generated Noise

Measured according to IEC 61672-3:2013 11.1 and ANSI S1.4-2014 Part 3: 11.1

Measurement	Test Result [dB]
A-weighted	40.41

-- End of measurement results--

-- End of Report--

Signatory: Jacob Cannon

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D0001.8406 Rev F

Calibration Certificate

Certificate Number 2022004780

Customer:
 Inspecciones Ambientales Tracsa SpA
 Avda Fajartas 1195
 Piso 15
 Santiago, Chile

Model Number CAL150
 Serial Number 8707
 Test Results **Pass**

Initial Condition As Manufactured

Description Larson Davis CAL150 Calibrator

Procedure Number D0001.8388
 Technician Scott Montgomery
 Calibration Date 12 Apr 2022
 Calibration Due 12 Apr 2024
 Temperature 23 °C ± 0.3 °C
 Humidity 29 %RH ± 3 %RH
 Static Pressure 101.4 kPa ± 1 kPa

Evaluation Method The data is acquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity. Data reported in dB re 20 µPa.

Compliance Standards Compliant to Manufacturer Specifications per D0001.8190 and the following standards:
 IEC 60942:2017 ANSI S1.40-2006

Issuing lab certifies that the instrument described above meets or exceeds all specifications as stated in the referenced procedure (unless otherwise noted). It has been calibrated using measurement standards traceable to the SI through the National Institute of Standards and Technology (NIST), or other national measurement institutes, and meets the requirements of ISO/IEC 17025:2017. Test points marked with a **‡** in the uncertainties column do not fall within this laboratory's scope of accreditation.

The quality system is registered to ISO 9001:2015.

This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.

The uncertainties were computed in accordance with the ISO Guide to the Expression of Uncertainty in Measurement (GUM). A coverage factor of approximately 2 sigma (k=2) has been applied to the standard uncertainty to express the expanded uncertainty at approximately 95% confidence level.

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Standards Used			
Description	Cal Date	Cal Due	Cal Standard
Agilent 34401A DMM	08/06/2021	08/06/2022	001021
Larson Davis Model 2900 Real Time Analyzer	03/31/2022	03/31/2023	001051
Microphone Calibration System	02/23/2022	02/23/2023	005446
1/2" Pre-amplifier	08/26/2021	08/26/2022	006506
Larson Davis 1/2" Pre-amplifier 7-pin LEMO	08/09/2021	08/09/2022	006507
1/2 inch Microphone - RI - 200V	09/23/2021	09/23/2022	006511
Hart Scientific 2626-H Temperature Probe	02/04/2021	08/04/2022	006767
Pressure Sensor	03/15/2022	12/14/2022	PCBN087008

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Certificate Number 2022054780

Output Level

Nominal Level [dB]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
114	100.9	114.01	113.70	114.30	0.14	Pass
94	101.4	93.95	93.70	94.30	0.15	Pass

- End of measurement results -

Frequency

Nominal Level [dB]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
114	100.9	1,000.18	993.00	1,007.00	0.20	Pass
94	101.4	1,000.22	993.00	1,007.00	0.20	Pass

- End of measurement results -

Total Harmonic Distortion + Noise (THD+N)

Nominal Level [dB]	Pressure [kPa]	Test Result [%]	Lower limit [%]	Upper limit [%]	Expanded Uncertainty [%]	Result
114	100.9	0.33	0.00	2.00	0.25 ±	Pass
94	101.4	0.45	0.00	2.00	0.25 ±	Pass

- End of measurement results -

Level Change Over Pressure

Tested at: 114 dB, 23 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [dB]	Lower limit [dB]	Upper limit [dB]	Expanded Uncertainty [dB]	Result
108.0	108.1	-0.05	-0.40	0.40	0.04 ±	Pass
101.3	101.2	0.00	-0.40	0.40	0.04 ±	Pass
92.0	91.8	0.06	-0.40	0.40	0.04 ±	Pass
83.0	83.0	0.07	-0.40	0.40	0.04 ±	Pass
74.0	74.2	0.05	-0.40	0.40	0.04 ±	Pass
65.0	65.2	-0.06	-0.40	0.40	0.04 ±	Pass

- End of measurement results -

Frequency Change Over Pressure

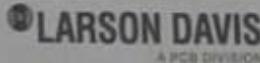
Tested at: 114 dB, 23 °C, 36 %RH

Nominal Pressure [kPa]	Pressure [kPa]	Test Result [Hz]	Lower limit [Hz]	Upper limit [Hz]	Expanded Uncertainty [Hz]	Result
108.0	108.1	0.00	-7.00	7.00	0.20 ±	Pass
101.3	101.2	0.00	-7.00	7.00	0.20 ±	Pass
92.0	91.8	0.01	-7.00	7.00	0.20 ±	Pass
83.0	83.0	0.01	-7.00	7.00	0.20 ±	Pass
74.0	74.2	0.01	-7.00	7.00	0.20 ±	Pass
65.0	65.2	0.01	-7.00	7.00	0.20 ±	Pass

- End of measurement results -

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Certificate Number 2022004780
Total Harmonic Distortion + Noise (THD+N) Over Pressure

Tested at: 114 dB, 23 °C, 36 %RH

Specified Pressure (kPa)	Pressure (kPa)	Test Result (%)	Lower Limit (%)	Upper Limit (%)	Expanded Uncertainty (%)	Result
108.0	108.1	0.33	0.00	2.00	0.25 ±	Pass
101.3	101.2	0.33	0.00	2.00	0.25 ±	Pass
92.0	91.8	0.34	0.00	2.00	0.25 ±	Pass
83.0	83.0	0.35	0.00	2.00	0.25 ±	Pass
74.0	74.2	0.37	0.00	2.00	0.25 ±	Pass
65.0	65.2	0.37	0.00	2.00	0.25 ±	Pass

- End of measurement results -

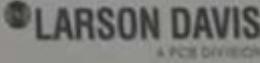
Signature: *Scott Montgomery*

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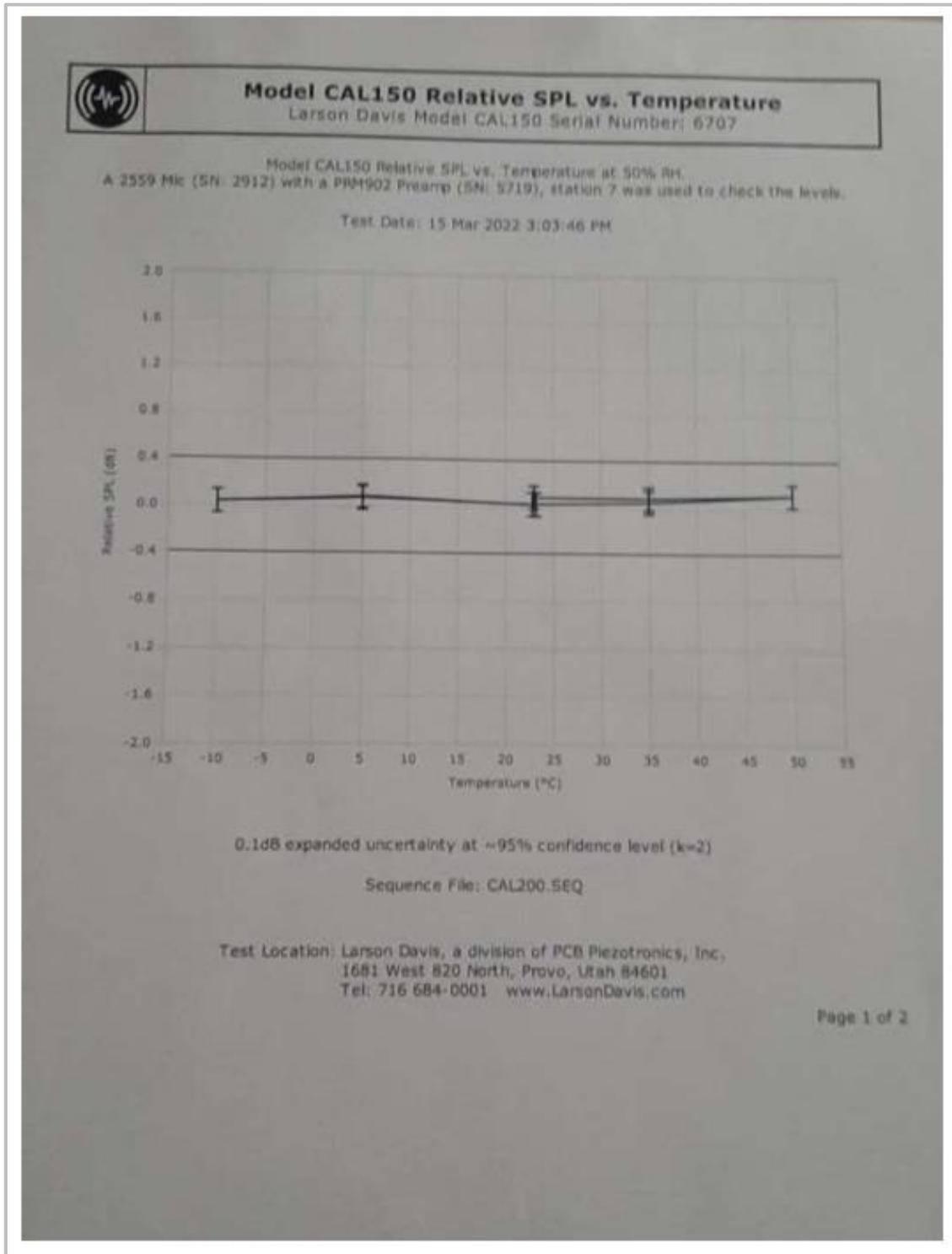
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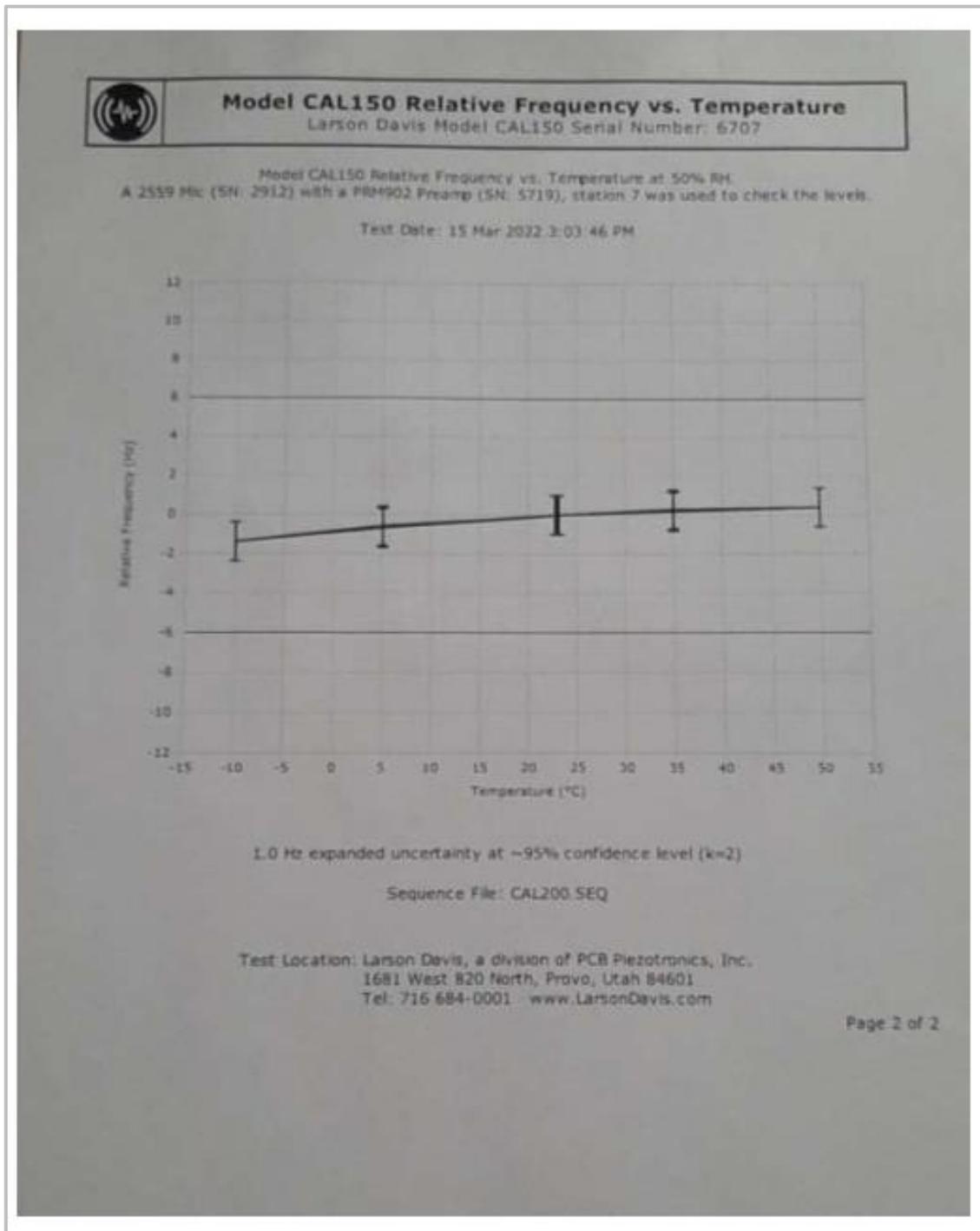
 

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(2000) 3210 Rev. D







CERTIFICADO DE CONFORMIDAD PARA INSTRUMENTOS ACÚSTICOS
Laboratorio de Calibración Acústica

Página 1 de 1 páginas

PROSON20220017
Fecha: 10-06-2022**I. DATOS DEL INSTRUMENTO.**

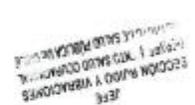
1. TIPO INSTRUMENTO: sonómetro
2. MARCA: LARSON DAVIS
3. MODELO: LxT2
4. N° SERIE: 0006704
5. N° CERTIFICADO CALIBRACIÓN: 2022005729 y 2022005733
6. EMISOR DEL CERTIFICADO DE CALIBRACIÓN: LARSON DAVIS A PCB PIEZOTRONICS DIV.
7. FECHA DEL CERTIFICADO DE CALIBRACIÓN: 03-05-2022

II. PRONUNCIAMIENTO:

Con respecto a la conformidad del sonómetro Certificado de Calibración N° 2022005729 y 2022005733, asociado al sonómetro, marca LARSON DAVIS, modelo LxT2, N° serie 0006704, junto a los datos antes individualizados en el punto I de este certificado; y sobre el cumplimiento de los requerimientos establecidos para **equipos nuevos** en el Decreto Exento N°542 del 30 de mayo de 2014, del MINSAL, que aprueba la Norma Técnica N°165 "Sobre el Certificado de Calibración Periódica para Sonómetros Integradores-Promediadores y Calibradores Acústicos de Terreno", en el marco de la aplicación del Decreto Supremo N° 38/2011 del MMA, "Norma de Emisión de Ruido Generados por Fuentes que Indica", podemos señalar que dicho certificado CUMPLE con las exigencias especificadas en esa normativa.

El certificado, y en consecuencia esta certificación de conformidad, tienen una **vigencia de 2 años** a partir de la fecha de emisión señalada anteriormente, 03-05-2022.

A partir del 22 de marzo de 2024, para el equipo antes individualizado comenzará a regir la exigencia señalada en el artículo 9 del Decreto Exento N° 542 que aprueba la Norma Técnica N°165 "Sobre el Certificado de Calibración Periódica para Sonómetros Integradores-Promediadores y Calibradores Acústicos de Terreno", con respecto a la obligatoriedad de realizar la calibración periódica en el Laboratorio de Calibración Acústica del Instituto de Salud Pública de Chile.



Mauricio Sánchez Valenzuela
Jefe Sección Ruido y Vibraciones
Departamento Salud Ocupacional
Instituto de Salud Pública de Chile



CERTIFICADO DE CONFORMIDAD PARA INSTRUMENTOS ACÚSTICOS
Laboratorio de Calibración Acústica

Página 1 de 1 páginas

PROCAL20220013

Fecha: 10-06-2022

I. DATOS DEL INSTRUMENTO.

1. TIPO INSTRUMENTO: calibrador acústico de terreno
2. MARCA: LARSON DAVIS
3. MODELO: CAL150
4. N° SERIE: 6707
5. N° CERTIFICADO CALIBRACIÓN: 2022004780
6. EMISOR DEL CERTIFICADO DE CALIBRACIÓN: LARSON DAVIS A PCB PIEZOTRONICS DIV.
7. FECHA DEL CERTIFICADO DE CALIBRACIÓN: 12-04-2022

II. PRONUNCIAMIENTO:

Con respecto a la conformidad del calibrador acústico de terreno Certificado de Calibración N° 2022004780, asociado al calibrador acústico de terreno, marca LARSON DAVIS, modelo CAL150, N° serie 6707, junto a los datos antes individualizados en el punto I de este certificado; y sobre el cumplimiento de los requerimientos establecidos para **equipos nuevos** en el Decreto Exento N°542 del 30 de mayo de 2014, del MINSAL, que aprueba la Norma Técnica N°165 "Sobre el Certificado de Calibración Periódica para Sonómetros Integradores-Promediadores y Calibradores Acústicos de Terreno", en el marco de la aplicación del Decreto Supremo N° 38/2011 del MMA, "Norma de Emisión de Ruido Generados por Fuentes que Indica", podemos señalar que dicho certificado CUMPLE con las exigencias especificadas en esa normativa.

El certificado, y en consecuencia esta certificación de conformidad, tienen una **vigencia de 2 años** a partir de la fecha de emisión señalada anteriormente, 12-04-2022.

A partir del 22 de marzo de 2024, para el equipo antes individualizado comenzará a regir la exigencia señalada en el artículo 9 del Decreto Exento N° 542 que aprueba la Norma Técnica N°165 "Sobre el Certificado de Calibración Periódica para Sonómetros Integradores-Promediadores y Calibradores Acústicos de Terreno", con respecto a la obligatoriedad de realizar la calibración periódica en el Laboratorio de Calibración Acústica del Instituto de Salud Pública de Chile.



Mauricio Sánchez Valenzuela
Jefe Sección Ruido y Vibraciones
Departamento Salud Ocupacional
Instituto de Salud Pública de Chile