

CALIBRATION CERTIFICATE

Certificate Number

44938230105020

Model: S1100
Serial Number: 230105020
Sensor ID: 230105-018
Calibration Location: 300 W. Antelope Rd. White City, OR 97503
Date of Calibration January 12, 2023

Next calibration on this instrument is due: January 12, 2024

Calibration Method Calibration of this instrument has been accomplished as defined in ISO 21501-4 2018: Light scattering airborne particle counter for clean spaces. All work performed is in accordance with Lighthouse Worldwide Solutions. Quality Manual P/N 714252800-1. Reproduction of this certificate and accompanying documentation is prohibited without the expressed written permission of Lighthouse Worldwide Solutions. All records of work performed are maintained by Lighthouse Worldwide Solutions.

Traceability The Standards of the Compliant Calibration Laboratory are traceable to the International System of Units (SI) through the National Institute of Standards and Technology, and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory. The unique laboratory calibration number identified above shall be used in referencing metrological traceability for artifacts identified only in this certificate.

Uncertainty The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k = 2$, which provides a confidence level of approximately 95%. The values and test criteria are applied using Simple Acceptance; Shared Risk approach.

Results This certifies the above named instrument conforms to the original specifications in effect at date of manufacture and test.

Environmental Conditions Ambient temperature 74.0 °F Relative humidity 40.0 %

Test Equipment

<u>Standards</u>	<u>Model</u>	<u>Manufacturer</u>	<u>Serial Number</u>	<u>Cal Date</u>	<u>Cal Due</u>
Flow meter	4043	TSI	1722011	10/11/2022	4/11/2023
DMM	Fluke 179	Fluke	39950490	3/11/2022	3/11/2023
MCA	8000D	Amptek	2028	6/20/2022	6/20/2023
Test Standard	3772	TSI	3772170705	1/18/2022	1/13/2023

Particle Size Standards

<u>Nominal Size</u>	<u>Particle Size</u>	<u>Tolerance (nm)</u>	<u>Lot No.</u>	<u>Manufacturer</u>	<u>Expiration Date</u>
0.10µm	0.10µm	+/- 7	PS3338B-1021	MAGSPHERE	10/11/2023
0.15µm	0.15µm	+/- 2.5	253237	Thermo Scientific	4/1/2025
0.20µm	0.20µm	+/- 2	250794	Thermo Scientific	3/1/2025
0.25µm	0.24µm	+/- 2.5	241433	Thermo Scientific	6/1/2024
0.30µm	0.30µm	+/- 3	257546	Thermo Scientific	8/1/2025
0.50µm	0.51µm	+/-3.5	255494	Thermo Scientific	6/1/2025
1.00µm	1.03µm	+/-5.5	257321	Thermo Scientific	8/1/2025
5.00µm	5.08µm	+/-30	245084	Thermo Scientific	9/1/2024

Counting Efficiency Particle Size Standards

<u>Nominal Size</u>	<u>Particle Size</u>	<u>Tolerance (nm)</u>	<u>Lot No.</u>	<u>Manufacturer</u>	<u>Expiration Date</u>
0.10µm	0.10µm	+/- 7	PS3338B-1021	MAGSPHERE	10/11/2023
0.20µm	0.20µm	+/- 2	250794	Thermo Scientific	3/1/2025

CALIBRATION RESULTS AS LEFT

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Size Calibrations as Left

<u>Channel</u>	<u>Channel Size</u>	<u>Threshold</u>	<u>Size Error</u>	<u>Expanded Uncertainty</u>	<u>Result</u>
1	0.10µm	25mV	0%	0.014 µm	Pass
2	0.15µm	1359mV	0%	0.005 µm	Pass
3	0.20µm	2913mV	0%	0.008 µm	Pass
4	0.25µm	4054mV	0%	0.006 µm	Pass
5	0.30µm	4682mV	0%	0.009 µm	Pass
6	0.50µm	5549mV	0%	0.01 µm	Pass
7	1.00µm	6297mV	0%	0.021 µm	Pass
8	5.00µm	7283mV	0%	0.067 µm	Pass

Measurements as Left

Nominal Flow Rate:	Measured	Tolerance	Expanded Uncertainty	Result
28.30 L/min	28.30 L/min	± 5% of nominal	0.82 L/min	Pass

False Count Rate:

JIS B 9921 Zero Count Observed Cts:	0	≤ 1 ct max / 5 min.	2 Particles/m3	Pass
ISO21501-4 False Count Rate	0	Upper confidence level		

Counting Efficiency 50%:

Size 0.104 µm	49.7%	30% - 70%	3.4%	Pass
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Counting Efficiency 100%:

Size 0.203 µm	101.9%	90% - 110%	4.4%	Pass
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Size Resolution:

Size 0.240 µm	3.60%	15%	2.6%	Pass
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CALIBRATION RESULTS AS FOUND

Certificate Number

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Size Calibrations as Found

<u>Channel</u>	<u>Channel Size</u>	<u>Threshold Settings</u>	<u>As Received Size</u>	<u>Percent Size Error</u>	<u>Size Error Tolerance</u>	<u>Expanded Uncertainty</u>	<u>Pass/Fail</u>
1	0.10µm	25mV	0.10µm	0.0%	+/- 10%	0.014 µm	Pass
2	0.15µm	1359mV	0.15µm	1.2%	+/- 10%	0.005 µm	Pass
3	0.20µm	2913mV	0.20µm	1.1%	+/-10%	0.008 µm	Pass
4	0.25µm	4054mV	0.25µm	-0.2%	+/-10%	0.006 µm	Pass
5	0.30µm	4682mV	0.30µm	-0.5%	+/-10%	0.009 µm	Pass
6	0.50µm	5549mV	0.50µm	-0.2%	+/-10%	0.01 µm	Pass
7	1.00µm	6297mV	1.00µm	-0.1%	+/-10%	0.021 µm	Pass
8	5.00µm	7283mV	4.99µm	-0.1%	+/-10%	0.067 µm	Pass

Measurements as Found

<u>Nominal Flow Rate:</u>	<u>Measured</u>	<u>Tolerance</u>	<u>Expanded Uncertainty</u>	<u>Result</u>
28.30 L/min	28.30 L/min	± 5% of nominal	0.82 L/min	Pass

False Count Rate:

JIS B 9921 Zero Count Observed Cts:	0	≤ 1 ct max / 5 min.	2 Particles/m3	Pass
ISO21501-4 False Count Rate	0	Upper confidence level		

Counting Efficiency 50%:

Size	0.104 µm	49.7%	30% - 70%	3.4%	Pass
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Counting Efficiency 100%:

Size	0.203 µm	101.9%	90% - 110%	4.4%	Pass
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Size Resolution:

Size	0.240 µm	3.60%	15%	2.6%	Pass
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Signature:
Metrology Manager


David Voeller

Metrology Manager acknowledges that the calibration has been carried out in accordance with ISO 17025:2017 and Lighthouse Worldwide Solutions ISO 17025 Quality Management system to comply to ISO 21501-4:2018 calibration requirements.

Signature:
Calibration Tech/Engineer:

 Joe B.