

ISO/IEC 17025 Calibration Certificate

201 Wolf Drive • P.O. Box 87 • Thorofare, NJ 08086-0087 • Phone: 856-686-1600 • Fax: 856-686-1601 • www.troemner.com • e-mail: troemner@troemner.com

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Weight
ID Number 12345A
Certificate Number 01008841-2
Date of Calibration 15-MAY-2018

SECTION 1: NAME AND ADDRESS OF CUSTOMER

End user
Troemner, LLC
201 Wolf Drive
Thorofare NJ 08086

Client
Troemner, LLC
201 Wolf Dr.
Thorofare NJ 08086

SECTION 2: APPROVED SIGNATORY



Joseph Moran, Metrology Manager

SECTION 3: PERSON PERFORMING WORK

Robotic Calibration

SECTION 4: CERTIFICATE INFORMATION

Description of Masses: Analytical Weight Set

| | | | |
|----------------|------------------------|---------------------|---------------|
| Accuracy Class | : ASTM E617-13 Class 1 | Date Received | : 08-MAY-2018 |
| Order Number | : 12345 | Date of Calibration | : 15-MAY-2018 |
| Construction | : One Piece, Two Piece | Date of Issue | : 15-MAY-2018 |
| Material | : Stainless Steel | Weight Range | : 1g-100g |
| | : Stainless Steel | | : 50mg-500mg |
| | : Aluminum | | : 1mg-20mg* |
| Serial Number | : 123456 | | |

SECTION 5: ENVIRONMENTAL CONDITIONS DURING TEST

Temperature: 21.44 °C Pressure: 759.63 mm Hg Relative Humidity: 52%

SECTION 6: PERTINENT INFORMATION

The Weights listed on this calibration report have been compared to reference mass standards that are traceable to the SI through the National Institute of Standards and Technology under Test No. 684/289871-17.

Reference standards and balances used to perform the calibration are listed in Section 10.

The weights calibrated for this report have been calibrated in accordance with Troemner's calibration process. The calibration performed meets the criteria as described in the current revisions of ASTM E617 and OIML R111.

This calibration also meets specifications as outlined in ISO/IEC 17025, ANSI/NCSL Z540-1-1994, and applicable documents.

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SECTION 7: TRUE MASS (MASS IN VACUUM) CALIBRATION DATA

| Nominal Mass Value | Notes | Serial Number | ----- True Mass ----- As Found | ----- As Left | Density ¹ of Weight | Uncertainty (+ or -) |
|--------------------|-------|---------------|-----------------------------------|------------------|-----------------------------------|---------------------------|
| 100 g | | | 100.000076 g | 100.000076 g | 8.0300 g/cm ³ | 0.050 mg |
| 50 g | | | 49.999992 g | 49.999992 g | 8.0300 g/cm ³ | 0.025 mg |
| 20 g | | | 20.000041 g | 20.000041 g | 8.0300 g/cm ³ | 0.015 mg |
| 20 g | * | | 20.000007 g | 20.000007 g | 8.0300 g/cm ³ | 0.015 mg |
| 10 g | | | 10.000029 g | 10.000029 g | 8.0300 g/cm ³ | 0.010 mg |
| 5 g | | | 4.9999767 g | 4.9999767 g | 8.0300 g/cm ³ | 0.0070 mg |
| 2 g | | | 2.0000216 g | 2.0000216 g | 8.0300 g/cm ³ | 0.0060 mg |
| 2 g | * | | 2.0000175 g | 2.0000175 g | 8.0300 g/cm ³ | 0.0060 mg |
| 1 g | | | 1.0000105 g | 1.0000105 g | 8.0300 g/cm ³ | 0.0060 mg |
| 500 mg | | | 0.5000056 g | 0.5000056 g | 7.9500 g/cm ³ | 0.0025 mg |
| 200 mg | | | 0.2000022 g | 0.2000022 g | 7.9500 g/cm ³ | 0.0025 mg |
| 200 mg | * | | 0.2000021 g | 0.2000021 g | 7.9500 g/cm ³ | 0.0025 mg |
| 100 mg | | | 0.1000037 g | 0.1000037 g | 7.9500 g/cm ³ | 0.0025 mg |
| 50 mg | | | 0.0499963 g | 0.0499963 g | 7.9500 g/cm ³ | 0.0025 mg |
| 20 mg | | | 0.0200104 g | 0.0200104 g | 2.7000 g/cm ³ | 0.0020 mg |
| 20 mg | * | | 0.0200087 g | 0.0200087 g | 2.7000 g/cm ³ | 0.0020 mg |
| 10 mg | | | 0.0099972 g | 0.0099972 g | 2.7000 g/cm ³ | 0.0020 mg |
| 5 mg | | | 0.0050045 g | 0.0050045 g | 2.7000 g/cm ³ | 0.0020 mg |
| 2 mg | | | 0.0019974 g | 0.0019974 g | 2.7000 g/cm ³ | 0.0020 mg |
| 2 mg | * | | 0.0020009 g | 0.0020009 g | 2.7000 g/cm ³ | 0.0020 mg |
| 1 mg | | | 0.0010032 g | 0.0010032 g | 2.7000 g/cm ³ | 0.0020 mg |

¹ Density is assumed unless otherwise stated
 * Denotes weight is marked with a dot.

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SECTION 8: CONVENTIONAL MASS CALIBRATION VALUE VS. REFERENCE DENSITY 8000 kg/m³

| Nominal Mass Value | Serial Number | Notes | ---- Conventional Mass Value ---- | | Uncertainty (+ or -) | Tolerance (+ or -) |
|--------------------|---------------|-------|-----------------------------------|--------------|----------------------|--------------------|
| | | | As Found | As Left | | |
| 100 g | | | 100.000132 g | 100.000132 g | 0.050 mg | 0.2500 mg |
| 50 g | | | 50.000020 g | 50.000020 g | 0.025 mg | 0.1200 mg |
| 20 g | | | 20.000052 g | 20.000052 g | 0.015 mg | 0.0740 mg |
| 20 g | * | | 20.000019 g | 20.000019 g | 0.015 mg | 0.0740 mg |
| 10 g | | | 10.000034 g | 10.000034 g | 0.010 mg | 0.0500 mg |
| 5 g | | | 4.9999795 g | 4.9999795 g | 0.0070 mg | 0.0340 mg |
| 2 g | | | 2.0000227 g | 2.0000227 g | 0.0060 mg | 0.0340 mg |
| 2 g | * | | 2.0000186 g | 2.0000186 g | 0.0060 mg | 0.0340 mg |
| 1 g | | | 1.0000110 g | 1.0000110 g | 0.0060 mg | 0.0340 mg |
| 500 mg | | | 0.5000052 g | 0.5000052 g | 0.0025 mg | 0.0100 mg |
| 200 mg | | | 0.2000020 g | 0.2000020 g | 0.0025 mg | 0.0100 mg |
| 200 mg | * | | 0.2000019 g | 0.2000019 g | 0.0025 mg | 0.0100 mg |
| 100 mg | | | 0.1000036 g | 0.1000036 g | 0.0025 mg | 0.0100 mg |
| 50 mg | | | 0.0499962 g | 0.0499962 g | 0.0025 mg | 0.0100 mg |
| 20 mg | | | 0.0200045 g | 0.0200045 g | 0.0020 mg | 0.0100 mg |
| 20 mg | * | | 0.0200028 g | 0.0200028 g | 0.0020 mg | 0.0100 mg |
| 10 mg | | | 0.0099943 g | 0.0099943 g | 0.0020 mg | 0.0100 mg |
| 5 mg | | | 0.0050030 g | 0.0050030 g | 0.0020 mg | 0.0100 mg |
| 2 mg | | | 0.0019968 g | 0.0019968 g | 0.0020 mg | 0.0100 mg |
| 2 mg | * | | 0.0020003 g | 0.0020003 g | 0.0020 mg | 0.0100 mg |
| 1 mg | | | 0.0010029 g | 0.0010029 g | 0.0020 mg | 0.0100 mg |

* Denotes weight is marked with a dot.

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SECTION 9: CONVENTIONAL MASS CALIBRATION DATA VS. REFERENCE DENSITY 8000 kg/m³

| Nominal Mass Value | Serial Number | Notes | -- Conventional Mass Correction -- | | Uncertainty (+ or -) | Tolerance (+ or -) |
|--------------------|---------------|-------|------------------------------------|------------|----------------------|--------------------|
| | | | As Found | As Left | | |
| 100 g | | | 0.132 mg | 0.132 mg | 0.050 mg | 0.2500 mg |
| 50 g | | | 0.020 mg | 0.020 mg | 0.025 mg | 0.1200 mg |
| 20 g | | | 0.052 mg | 0.052 mg | 0.015 mg | 0.0740 mg |
| 20 g | * | | 0.019 mg | 0.019 mg | 0.015 mg | 0.0740 mg |
| 10 g | | | 0.034 mg | 0.034 mg | 0.010 mg | 0.0500 mg |
| 5 g | | | -0.0205 mg | -0.0205 mg | 0.0070 mg | 0.0340 mg |
| 2 g | | | 0.0227 mg | 0.0227 mg | 0.0060 mg | 0.0340 mg |
| 2 g | * | | 0.0186 mg | 0.0186 mg | 0.0060 mg | 0.0340 mg |
| 1 g | | | 0.0110 mg | 0.0110 mg | 0.0060 mg | 0.0340 mg |
| 500 mg | | | 0.0052 mg | 0.0052 mg | 0.0025 mg | 0.0100 mg |
| 200 mg | | | 0.0020 mg | 0.0020 mg | 0.0025 mg | 0.0100 mg |
| 200 mg | * | | 0.0019 mg | 0.0019 mg | 0.0025 mg | 0.0100 mg |
| 100 mg | | | 0.0036 mg | 0.0036 mg | 0.0025 mg | 0.0100 mg |
| 50 mg | | | -0.0038 mg | -0.0038 mg | 0.0025 mg | 0.0100 mg |
| 20 mg | | | 0.0045 mg | 0.0045 mg | 0.0020 mg | 0.0100 mg |
| 20 mg | * | | 0.0028 mg | 0.0028 mg | 0.0020 mg | 0.0100 mg |
| 10 mg | | | -0.0057 mg | -0.0057 mg | 0.0020 mg | 0.0100 mg |
| 5 mg | | | 0.0030 mg | 0.0030 mg | 0.0020 mg | 0.0100 mg |
| 2 mg | | | -0.0032 mg | -0.0032 mg | 0.0020 mg | 0.0100 mg |
| 2 mg | * | | 0.0003 mg | 0.0003 mg | 0.0020 mg | 0.0100 mg |
| 1 mg | | | 0.0029 mg | 0.0029 mg | 0.0020 mg | 0.0100 mg |

* Denotes weight is marked with a dot.

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SECTION 10: CALIBRATION PROCEDURE DATA

| Nominal Mass Value | Serial Number | Standard Set No. | Cal Due | Balance Used | Cal Due | Procedure Used |
|--------------------|---------------|------------------|----------|--------------|----------|----------------|
| 100 g | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 50 g | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 20 g | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 20 g * | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 10 g | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 5 g | | C006 | 07/01/18 | A200XXL-133 | 01/01/19 | Multi A-B |
| 2 g | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 2 g * | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 1 g | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 500 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 200 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 200 mg * | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 100 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 50 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 20 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 20 mg * | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 10 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 5 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 2 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 2 mg * | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |
| 1 mg | | S120A | 07/01/18 | A5XL-134 | 01/01/19 | Multi A-B |

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SECTION 11: GENERAL INFORMATION

This calibration was performed in Troemner's High Precision Level I Mass Metrology Laboratory at 201 Wolf Drive, Thorofare, New Jersey 08086 unless otherwise noted on the Addendum. The internal procedures used are CAL-CLASSI and METR-MAP.

SECTION 12: DEFINITIONS AND TERMS

TRUE MASS - The mass of a weight as if it were measured in a vacuum. Also known as Mass in a Vacuum.

CONVENTIONAL MASS - The conventional value of the result of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20 °C, the conventional mass is the mass of a reference weight of a density of 8000 kg/m³ which it balances in air of a density of 1.2 kg/m³.

AS FOUND TRUE MASS - The measured value of the mass(es) as they were received by Troemner.

AS LEFT TRUE MASS - The measured value of the mass(es) after adjustment, repair, or replacement when necessary. The As Found True Mass will equal the As Left True Mass if the mass(es) did not require adjustment, repair or replacement.

NOMINAL MASS - The mass value as marked on the weight.

CORRECTION - The difference between the conventional mass value of a weight and its nominal value. A positive correction indicates that the conventional mass value is greater than the nominal value by the amount of the correction.

AS FOUND CONVENTIONAL MASS CORRECTION - The conventional correction of the result, as it was received by Troemner, of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20 °C, the conventional mass is the mass of a reference weight of density 8000 kg/m³ which it balances in air density of 1.2 kg/m³. If the customer requires cleaning prior to calibration, the after cleaning correction would be reported.

AS LEFT CONVENTIONAL MASS CORRECTION - The conventional correction of the result, after adjustment, repair, or replacement of weighing in air in accordance to International Recommendation D 28. For a weight taken at 20 °C, the conventional mass is the mass of a reference weight of density 8000 kg/m³ which it balances in air density of 1.2 kg/m³. The As Found will equal the As Left Conventional Mass Correction if the mass(es) did not require adjustment, repair or replacement.

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SECTION 12: DEFINITIONS AND TERMS (continued)

UNCERTAINTY - Non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used. The uncertainty is calculated in accordance with NIST TechNote 1297 using a coverage factor of $k = 2$ ($k = 2$ defines an interval having a level of confidence of approximately 95 percent). The uncertainty does not include possible effects of magnetism.

TOLERANCE - Defines the limits in which the correction value and the uncertainty must fall to meet the tolerance specification for the given Class.

AS FOUND CONVENTIONAL MASS VALUE - The measured value of the mass(es) as they were received by Troemner, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20 °C, the conventional mass is the mass of a reference weight of density 8000 kg/m³ which it balances in air density of 1.2 kg/m³. If the customer requires cleaning prior to calibration, the after cleaning value would be reported.

AS LEFT CONVENTIONAL MASS VALUE - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary, of weighing in air in accordance to International Recommendation OIML D 28. For a weight taken at 20 °C, the Conventional Mass is the mass of a reference weight of density 8000 kg/m³ which it balances in air density of 1.2 kg/m³. The As Found will equal the As Left Conventional Mass Value if the mass(es) did not require adjustment, repair or replacement.

ASTM E617 - Weights meet the tolerance specification for ASTM E617. Weights 2kg - 1g screened for magnetism using a Gaussmeter.