

# 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 120402  
Certificate Number 90000000-1  
Date of Calibration 08-DEC-2003

## SECTION 1: NAME AND ADDRESS OF CUSTOMER

End user  
Henry Troemner LLC  
201 Wolf Drive  
Thorofare, NJ 08086

Client  
Henry Troemner LLC  
201 Wolf Drive  
Thorofare, NJ 08086

## SECTION 2: APPROVED SIGNATORY

Joseph Moran

## SECTION 3: PERSON PERFORMING WORK

Katharine Ellison

## SECTION 4: CERTIFICATE INFORMATION

Description of Masses: 5kg - 2mg Weight Set

Accuracy Class	: ASTM E617-97* Class 1	Date Received	: 04-DEC-2003
Order Number	: 123456	Date of Calibration	: 08-DEC-2003
Construction	: One Piece	Date of Issue	: 08-DEC-2003
Material	: Stainless Steel	Weight Range	: 5kg - 1g
	: Stainless Steel (mg)		: 500mg - 50mg
	: Aluminum		: 30mg - 2mg
Serial Number	: 120402		

## SECTION 5: ENVIRONMENTAL CONDITIONS DURING TEST

Temperature: 21.00°C      Pressure: 760.00 mm Hg      Relative Humidity: 43%

## SECTION 6: PERTINENT INFORMATION

The Weights listed on this calibration report have been compared to reference mass standards that are directly traceable to the National Institute of Standards and Technology under Test No. 822/267283-02.

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 Level I criteria as described in the NIST/NVLAP Technical Guide 150-2.

This calibration also meets specifications as outlined in ISO 9001, ISO/IEC 17025, ANSI/NCSL Z540-1-1994, NCR Document 10CFR50 Appendix B, and applicable documents.

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

Nominal Mass Value	Serial Number	----- True Mass -----		Density <sup>1</sup> of Weight	Uncertainty ( + or - )
		As Found	As Left		
5 kg		5000.00648 g	5000.00648 g	8.0000 g/cm <sup>3</sup>	0.30 mg
3 kg		3000.00285 g	3000.00285 g	8.0000 g/cm <sup>3</sup>	0.19 mg
2 kg		2000.00195 g	2000.00195 g	8.0000 g/cm <sup>3</sup>	0.14 mg
1 kg	75362	1000.001373 g	1000.001373 g	8.0000 g/cm <sup>3</sup>	0.050 mg
500 g		500.000677 g	500.000677 g	8.0000 g/cm <sup>3</sup>	0.050 mg
300 g		300.000472 g	300.000472 g	8.0000 g/cm <sup>3</sup>	0.040 mg
200 g		200.000213 g	200.000213 g	8.0000 g/cm <sup>3</sup>	0.033 mg
100 g	6527	100.000044 g	100.000044 g	8.0000 g/cm <sup>3</sup>	0.017 mg
50 g		50.000059 g	50.000059 g	8.0000 g/cm <sup>3</sup>	0.010 mg
30 g		30.000038 g	30.000038 g	8.0000 g/cm <sup>3</sup>	0.005 mg
20 g		20.000021 g	20.000021 g	8.0000 g/cm <sup>3</sup>	0.005 mg
10 g		10.000011 g	10.000011 g	8.0000 g/cm <sup>3</sup>	0.004 mg
5 g		5.0000022 g	5.0000022 g	8.0000 g/cm <sup>3</sup>	0.0020 mg
3 g		3.0000022 g	3.0000022 g	8.0000 g/cm <sup>3</sup>	0.0020 mg
2 g		2.0000004 g	2.0000004 g	8.0000 g/cm <sup>3</sup>	0.0015 mg
1 g	6528	1.0000002 g	1.0000002 g	8.0000 g/cm <sup>3</sup>	0.0015 mg
500 mg		0.4999971 g	0.4999971 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
300 mg		0.2999998 g	0.2999998 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
200 mg		0.2000019 g	0.2000019 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
100 mg		0.0999970 g	0.0999970 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
50 mg		0.0500004 g	0.0500004 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
30 mg		0.0300001 g	0.0300001 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
20 mg		0.0200017 g	0.0200017 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
10 mg	6530	0.0100010 g	0.0100010 g	7.9500 g/cm <sup>3</sup>	0.0006 mg
5 mg		0.0050003 g	0.0050003 g	2.7000 g/cm <sup>3</sup>	0.0006 mg
3 mg		0.0030027 g	0.0030027 g	2.7000 g/cm <sup>3</sup>	0.0006 mg
2 mg		0.0019999 g	0.0019999 g	2.7000 g/cm <sup>3</sup>	0.0006 mg

<sup>1</sup> Density is assumed unless otherwise stated

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**Weight**

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## SECTION 8: MASS IN AIR CALIBRATION VALUE VS. REFERENCE DENSITY 8000 kg m<sup>-3</sup>

Nominal Mass Value	Serial Number	---- Conventional Mass Value ----		Uncertainty ( + or - )	Tolerance ( + or - )
		As Found	As Left		
5 kg		5000.00648 g	5000.00648 g	0.30 mg	12.0000 mg
3 kg		3000.00285 g	3000.00285 g	0.19 mg	7.5000 mg
2 kg		2000.00195 g	2000.00195 g	0.14 mg	5.0000 mg
1 kg	75362	1000.001373 g	1000.001373 g	0.050 mg	2.5000 mg
500 g		500.000677 g	500.000677 g	0.050 mg	1.2000 mg
300 g		300.000472 g	300.000472 g	0.040 mg	0.7500 mg
200 g		200.000213 g	200.000213 g	0.033 mg	0.5000 mg
100 g	6527	100.000044 g	100.000044 g	0.017 mg	0.2500 mg
50 g		50.000059 g	50.000059 g	0.010 mg	0.1200 mg
30 g		30.000038 g	30.000038 g	0.005 mg	0.0740 mg
20 g		20.000021 g	20.000021 g	0.005 mg	0.0740 mg
10 g		10.000011 g	10.000011 g	0.004 mg	0.0500 mg
5 g		5.0000223 g	5.0000223 g	0.0020 mg	0.0340 mg
3 g		3.0000023 g	3.0000023 g	0.0020 mg	0.0340 mg
2 g		2.0000004 g	2.0000004 g	0.0015 mg	0.0340 mg
1 g	6528	1.0000002 g	1.0000002 g	0.0015 mg	0.0340 mg
500 mg		0.4999966 g	0.4999966 g	0.0006 mg	0.0100 mg
300 mg		0.2999992 g	0.2999992 g	0.0006 mg	0.0100 mg
200 mg		0.2000017 g	0.2000017 g	0.0006 mg	0.0100 mg
100 mg		0.0999969 g	0.0999969 g	0.0006 mg	0.0100 mg
50 mg		0.0500003 g	0.0500003 g	0.0006 mg	0.0100 mg
30 mg		0.0300001 g	0.0300001 g	0.0006 mg	0.0100 mg
20 mg		0.0200017 g	0.0200017 g	0.0006 mg	0.0100 mg
10 mg	6530	0.0100010 g	0.0100010 g	0.0006 mg	0.0100 mg
5 mg		0.0050002 g	0.0050002 g	0.0006 mg	0.0100 mg
3 mg		0.0030021 g	0.0030021 g	0.0006 mg	0.0100 mg
2 mg		0.0019993 g	0.0019993 g	0.0006 mg	0.0100 mg

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SECTION 9: MASS IN AIR CALIBRATION DATA VS. REFERENCE DENSITY 8000 kg m<sup>-3</sup>

Nominal Mass Value	Serial Number	-- Conventional Mass Correction --		Uncertainty ( + or - )	Tolerance ( + or - )
		As Found	As Left		
5 kg	75362	6.48 mg	6.48 mg	0.30 mg	12.0000 mg
3 kg		2.85 mg	2.85 mg	0.19 mg	7.5000 mg
2 kg		1.95 mg	1.95 mg	0.14 mg	5.0000 mg
1 kg		1.373 mg	1.373 mg	0.050 mg	2.5000 mg
500 g		0.677 mg	0.677 mg	0.050 mg	1.2000 mg
300 g	6527	0.472 mg	0.472 mg	0.040 mg	0.7500 mg
200 g		0.213 mg	0.213 mg	0.033 mg	0.5000 mg
100 g		0.044 mg	0.044 mg	0.017 mg	0.2500 mg
50 g		0.059 mg	0.059 mg	0.010 mg	0.1200 mg
30 g		0.038 mg	0.038 mg	0.005 mg	0.0740 mg
20 g	6528	0.021 mg	0.021 mg	0.005 mg	0.0740 mg
10 g		0.011 mg	0.011 mg	0.004 mg	0.0500 mg
5 g		0.0223 mg	0.0223 mg	0.0020 mg	0.0340 mg
3 g		0.0023 mg	0.0023 mg	0.0020 mg	0.0340 mg
2 g		0.0004 mg	0.0004 mg	0.0015 mg	0.0340 mg
1 g	6530	0.0002 mg	0.0002 mg	0.0015 mg	0.0340 mg
500 mg		-0.0034 mg	-0.0034 mg	0.0006 mg	0.0100 mg
300 mg		-0.0008 mg	-0.0008 mg	0.0006 mg	0.0100 mg
200 mg		0.0017 mg	0.0017 mg	0.0006 mg	0.0100 mg
100 mg		-0.0031 mg	-0.0031 mg	0.0006 mg	0.0100 mg
50 mg	6530	0.0003 mg	0.0003 mg	0.0006 mg	0.0100 mg
30 mg		0.0001 mg	0.0001 mg	0.0006 mg	0.0100 mg
20 mg		0.0017 mg	0.0017 mg	0.0006 mg	0.0100 mg
10 mg		0.0010 mg	0.0010 mg	0.0006 mg	0.0100 mg
5 mg		0.0002 mg	0.0002 mg	0.0006 mg	0.0100 mg
3 mg	6530	0.0021 mg	0.0021 mg	0.0006 mg	0.0100 mg
2 mg		-0.0007 mg	-0.0007 mg	0.0006 mg	0.0100 mg

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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	
5 kg	75362	S1		PM5003-002		Mass Code	
3 kg		S1		PM5003-002		Mass Code	
2 kg		S1		PM5003-002		Mass Code	
1 kg		S1		AT1005-010		Mass Code	
500 g		S1		AT1005-010		Mass Code	
300 g	6527	S1		AT1005-010		Mass Code	
200 g		S1		AT1005-010		Mass Code	
100 g		S1		AT106-011		Mass Code	
50 g		S1		AT106-011		Mass Code	
30 g		S1		AT106-011		Mass Code	
20 g		S1		AT21-012		Mass Code	
10 g		S1		AT21-012		Mass Code	
5 g		S1		UMT5-013		Mass Code	
3 g		S1		UMT5-013		Mass Code	
2 g		S1		UMT5-013		Mass Code	
1 g	6528	S1		UMT5-013		Mass Code	
500 mg		S1		UMT5-013		Mass Code	
300 mg		S1		UMT5-013		Mass Code	
200 mg		S1		UMT5-013		Mass Code	
100 mg		S1		UMT5-013		Mass Code	
50 mg		S1		UMT5-013		Mass Code	
30 mg		S1		UMT5-013		Mass Code	
20 mg		S1		UMT5-013		Mass Code	
10 mg		6530	S1		UMT5-013		Mass Code
5 mg			S1		UMT5-013		Mass Code
3 mg	S1			UMT5-013		Mass Code	
2 mg	S1			UMT5-013		Mass Code	

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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 page one. The internal procedures used are CAL-CLASSI, CAL-MMAP, and NIST HB145.

## SECTION 12: DEFINITIONS AND TERMS

**MASS IN A VACUUM** - The mass of a weight as if it were measured in a vacuum. Also known as True Mass.

**MASS IN AIR** - The conventional value of the result of weighing in air, in accordance to International Recommendation OIML R 33. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of a density of 8000 kg·m<sup>-3</sup> which it balances in air of a density of 1.2 kg·m<sup>-3</sup>.

**AS FOUND MASS IN A VACUUM** - The measured value of the mass(es) as they were received by Troemner. If the customer requires cleaning prior to calibration, the after cleaning value would be reported.

**AS LEFT MASS IN A VACUUM** - The measured value of the mass(es) after they were adjusted, repaired or replaced when necessary. The As Found Mass in a Vacuum will equal the As Left Mass in a Vacuum 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 mass value of a weight and its nominal value. A positive correction indicates that the 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 R 33. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m<sup>-3</sup> which it balances in air density of 1.2 kg·m<sup>-3</sup>. 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 R 33. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m<sup>-3</sup> which it balances in air density of 1.2 kg·m<sup>-3</sup>. The As Found will equal the As Left Conventional Mass Correction if the mass(es) did not require adjustment, repair or replacement.

**UNCERTAINTY** - The error in assignment of the correction due to the measurement process. Uncertainty is calculated in accordance with UKAS document M3003 using a coverage factor of  $k = 2$  ( $k = 2$  defines an interval having a level of confidence of approximately 95 percent). The error does not include the effects of magnetism. *(continued on next page)*

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## SECTION 12: DEFINITIONS AND TERMS (continued)

**TOLERANCE** - Defines the limits in which the correction value & 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 R 33. For a weight taken at 20° C, the conventional mass is the mass of a reference weight of density 8000 kg·m<sup>-3</sup> which it balances in air density of 1.2 kg·m<sup>-3</sup>. If the customer requires cleaning prior to calibration, the after cleaning value would be reported. F denotes Out of Tolerance Weight.

**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 R 33. For a weight taken at 20° C, the Conventional Mass is the mass of a reference weight of density 8000 kg·m<sup>-3</sup> which it balances in air density of 1.2 kg·m<sup>-3</sup>. The As Found will equal the As Left Conventional Mass Value if the mass(es) did not require adjustment, repair or replacement.

**ASTM E617-97\*** - Weights meet the tolerance specification for ASTM E617-97. Weights 2kg - 1g screened for magnetism using a Gaussmeter.

## SECTION 13: ADDENDUM

No calibration due dates for standards provided