

Certificate of Calibration

Submitted For: Sartorius NA-TCC		Test #: 05-000000
6542 Fig Street		Serial #: 01-00000-1
Arvada CO 80004		Range: 100 g - 1 mg Class: 2
Date of Report: ^{Note 1} 1/3/06		
Manufacturer: Denver Instrument Co.		

Test Conditions: 21.0 °C 623.4 mmHg 46.4 %RH Grams weights are Type: I

Nominal Value	Conventional Mass Correction (mg)	Uncertainty in mg @ K=2	Bal ID	As Found ^{Note 2} value in mg	Density g/cm ³	Magnetism Gauss ^{Note 3}	Volume cm ³	Coefficient of expansion	True Mass Correction	Condition Notes
100 g	-0.1348	±0.0249	21		7.85 SS	Passed	12.7389	0.000045	0.1519	
50 g	0.1201	±0.0162	21		7.85 SS	Passed	6.3695	0.000045	0.2634	
20 g	0.0400	±0.0100	21		7.85 SS	Passed	2.5478	0.000045	0.0973	
20 g*	0.0577	±0.0100	21		7.85 SS	Passed	2.5478	0.000045	0.1150	
10 g	0.0549	±0.0075	21		7.85 SS	Passed	1.2739	0.000045	0.0836	
5 g	0.0319	±0.0052	123		7.85 SS	Passed	0.6369	0.000045	0.0462	
2 g	-0.0315	±0.0048	123		7.85 SS	Passed	0.2548	0.000045	-0.0257	
2 g*	-0.0078	±0.0048	123		7.85 SS	Passed	0.2548	0.000045	-0.0021	
1 g	0.0082	±0.0048	123		7.85 SS	Passed	0.1274	0.000045	0.0111	
500 mg	-0.0035	±0.0015	123		7.85 SS	Passed	0.06369	0.000045	-0.0020	
200 mg	-0.0062	±0.0012	123		7.85 SS	Passed	0.02548	0.000045	-0.0056	
200 mg*	-0.0071	±0.0012	123		7.85 SS	Passed	0.02548	0.000045	-0.0066	
100 mg	-0.0076	±0.0012	123		7.85 SS	Passed	0.01274	0.000045	-0.0073	
50 mg	-0.0007	±0.0013	123		7.85 SS	Passed	0.00637	0.000045	-0.0006	
20 mg	-0.0004	±0.0012	123		7.85 SS	Passed	0.00255	0.000045	-0.0003	
20 mg*	0.0006	±0.0012	123		7.85 SS	Passed	0.00255	0.000045	0.0007	
10 mg	0.0011	±0.0013	123		7.85 SS	Passed	0.00127	0.000045	0.0012	
5 mg	-0.0027	±0.0012	123		2.70 Al	N/A	0.00185	0.000069	-0.0012	
2 mg	-0.0102	±0.0012	123		2.70 Al	N/A	0.00074	0.000069	-0.0096	
1 mg	-0.0094	±0.0012	123		2.70 Al	N/A	0.00037	0.000069	-0.0091	

Notes:

- For weights shipped from inventory actual test date may vary.
- In accordance with ANSI/ISO/IEC 17025:2000 as found values only reported on weights which have been adjusted or replaced.
- Magnetism in Gauss No uncertainty assigned to this component
- Weights are cleaned by wiping with alcohol.



NVLAP Lab Code 200106-0



Procedures and Traceability information

This report pertains to the above listed artifacts and parameters only. The values reported were found at the time of test by using one of the following: Standard denomination metric weights are calibrated using weighing designs A.1.1, A.2.1 or A.2.3 described in NBS Tech note 952 data reduction uses the NIST masscode software. Non-standard metric and non-metric weights are calibrated using double substitution as described in NIST 969 SOP 4. Using the NIST provided masscode software we propagate mass values from our primary standards MT57, which are calibrated every three years, and use the values reported under NIST test #822/268214-03 dated 02/11/03. Our working standards MT7, MT50 and MT53 are calibrated every 6 months the last Calibration was on 11/07/05 under test number 05-103105. Therefore the reported values are traceable to the International Prototype Kilogram through NIST and comply with ANSI/NCSL Z540 and ANSI/ISO/IEC 17025:2000. Accredited by NVLAP for the specific scope of accreditation under lab code 200106-0. This report does not provide endorsement by NVLAP or any other government agency, and may not be reproduced except in full without our written permission.



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Table of Weight Tolerances

	ASTM E617					NBS Circular 547				OIML R-111			
	Class 0(U*)	Class 1	Class 2	Class 3	Class 4	Class M	Class S	Class S1	Class P	Class E1	Class E2	Class F1	Class F2
Nominal Value	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg	Tolerance in mg
5 kg	6.00	12.0	25.0	50	100	25.0	12.0	50	100	2.5	7.5	25	75
3 kg	3.75	7.5	15.0	30	60	15.0	7.5	30	60				
2 kg	2.50	5.0	10.0	20	40	10.0	5.0	20	40	1.0	3.0	10	30
1 kg	1.25	2.5	5.0	10	20	5.0	2.5	10	20	0.5	1.5	5	15
500 g	0.600	1.20	2.50	5.0	10.0	2.50	1.20	5.0	10.0	0.25	0.75	2.5	7.5
300 g	0.380	0.75	1.50	3.0	6.0	1.50	0.75	3.0	6.0				
200 g	0.250	0.50	1.00	2.0	4.0	1.00	0.50	2.0	4.0	0.10	0.30	1.0	3.0
100 g	0.125	0.25	0.50	1.0	2.0	0.50	0.25	1.0	2.0	0.05	0.15	0.5	1.5
50 g	0.060	0.120	0.250	0.60	1.20	0.250	0.120	0.60	1.20	0.030	0.10	0.30	1.0
30 g	0.037	0.074	0.150	0.45	0.90	0.150	0.074	0.45	0.90				
20 g	0.037	0.074	0.100	0.35	0.70	0.100	0.074	0.35	0.70	0.025	0.080	0.25	0.8
10 g	0.025	0.050	0.074	0.25	0.50	0.050	0.074	0.25	0.50	0.020	0.060	0.20	0.6
5 g	0.017	0.034	0.054	0.18	0.36	0.034	0.054	0.18	0.36	0.015	0.050	0.15	0.5
3 g	0.017	0.034	0.054	0.15	0.30	0.034	0.054	0.15	0.30				
2 g	0.017	0.034	0.054	0.13	0.26	0.034	0.054	0.13	0.26	0.012	0.040	0.12	0.4
1 g	0.017	0.034	0.054	0.10	0.20	0.034	0.054	0.10	0.20	0.010	0.030	0.10	0.3
500 mg	0.005	0.010	0.025	0.080	0.16	0.010	0.025	0.080	0.16	0.008	0.025	0.08	0.25
300 mg	0.005	0.010	0.025	0.070	0.14	0.010	0.025	0.070	0.14				
200 mg	0.005	0.010	0.025	0.060	0.12	0.010	0.025	0.060	0.12	0.006	0.020	0.06	0.20
100 mg	0.005	0.010	0.025	0.050	0.10	0.010	0.025	0.050	0.10	0.005	0.015	0.05	0.15
50 mg	0.005	0.010	0.014	0.042	0.085	0.010	0.014	0.042	0.085	0.004	0.012	0.04	0.12
30 mg	0.005	0.010	0.014	0.038	0.075	0.010	0.014	0.038	0.075				
20 mg	0.005	0.010	0.014	0.035	0.070	0.010	0.014	0.035	0.070	0.003	0.010	0.030	0.10
10 mg	0.005	0.010	0.014	0.030	0.060	0.010	0.014	0.030	0.060	0.002	0.008	0.025	0.08
5 mg	0.005	0.010	0.014	0.028	0.055	0.010	0.014	0.028	0.055	0.002	0.006	0.020	0.06
3 mg	0.005	0.010	0.014	0.026	0.052	0.010	0.014	0.026	0.052				
2 mg	0.005	0.010	0.014	0.025	0.050	0.010	0.014	0.025	0.050	0.002	0.006	0.020	0.06
1 mg	0.005	0.010	0.014	0.025	0.050	0.010	0.014	0.025	0.050	0.002	0.006	0.020	0.06

For values between those shown on the chart use the value of the weight which would fall below it on the chart. For non-metric weights convert to metric and follow the same procedure. For example: If using a 400 gram or a 1 lb (453.6g) weight use the tolerance for 300 grams. For classes not shown contact Denver Instrument Company for tolerances. * Class U is a Denver Instrument classification in which the weights are adjusted to class zero tolerances but meet class 1 specifications for markings and density.

Uncertainty

The combined uncertainty includes: Type A components: The standard deviation of the balance. Type B components: Uncertainty of the Air Density Calculation, Uncertainty of the Standard, Uncertainty of the Standard's Density, and the Uncertainty of the Density of the mass under test. The combined uncertainty is multiplied by a coverage factor of 2 to give the expanded uncertainty at the 95 percent confidence level. The expanded uncertainty presented in this report is consistent with the ISO Guide to the Expression of Uncertainty in Measurement. The expanded uncertainty should not be used as a tolerance limit by the user during application.

When to Recertify Mass Standards

ISO/IEC 17025 paragraph 5.10.4.4 states: "A calibration certificate (or calibration label) shall not contain any recommendation on the calibration interval except where this has been agreed with the client." Therefore, Denver Instrument Company does not provide a calibration due date. Setting calibration intervals is the responsibility of the end user. As a general guideline the following calibration intervals may be appropriate:

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|---------------------|--------------------|
| 1. Normal usage; | One year |
| 2. Heavy daily use; | Three – six months |
| 3. Light usage; | Two – three years |

Normal usage can be daily but only one or two times a day. Heavy usage is daily use in excess of ten or more times a day. Light usage would be two or three times in a three-month period. Weights should also be recertified if they become contaminated with foreign material or are subjected to dropping, abrasion, scratching or denting. If the user experiences significant changes in mass between calibrations a reduction in the calibration interval should be considered. If you would like to discuss your specific requirements please give us a call.