Contents

RICE LAKE WEIGHING SYSTEMS
METROLOGICAL PRODUCTS & SERVICES GROUP

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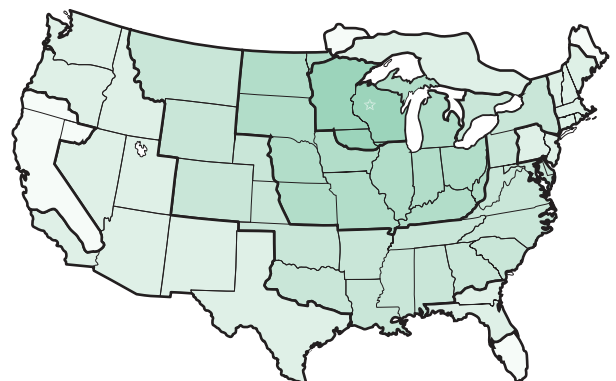**Stan Koch & Sons Trucking** (Truckload)
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Estimated days for UPS ground delivery from our plant in Rice Lake, Wisconsin.

1 Day	
2 Days	
3 Days	
4 Days	
5 Days	

Ordering Mass Standards or Test Weights

The introductory pages of this catalog contain all the information you'll need to place your mass standard or test weight order. If you're new to the specialized field of metrological weights, the ordering process can be broken into six simple steps:

1. Determine the regulatory standard that applies to your application. The international standard (OIML) is summarized on pages 3-4; the U.S. standard (ASTM E 617) is on page 5; the U.S. commercial standard for Legal-For-Trade applications (NIST Handbook 105-1) is on page 6.

2. Determine the accuracy class within the standard that your weights must meet. Accuracy classes are found in the chart on the bottom of this page.

3. Determine the tolerances necessary within that class required for your application. See pages 8-9 for metric weight tolerances, and page 10 for avoirdupois weight tolerances.

4. If traceability is required, determine if your weights require traceability to the national or international standard. See the chart on the bottom of this page, and more detailed information on pages 11-12.

5. Determine if your weights require a Traceable Certificate or a Weight Calibration Certificate. See the chart on the bottom of this page, and more detailed information on pages 12-16.

6. If your weights will require Legal-For-Trade certification prior to placing them in service, decide if you would like the certification to be handled by Rice Lake Weighing Systems' National Voluntary Laboratory Accreditation Program (NVLAP)-accredited lab, or sent to your state lab. For information on the certification process of NVLAP-accredited labs, see page 13.

Accuracy Classes for Mass Standards and Test Weights

CURRENT STANDARDS AND TEST WEIGHTS ACCURACY CLASSES				OBSOLETE STANDARD
TYPICAL USE	OIML[1]	ASTM E617[2]	NIST 105-1[3]	NBS CIR. 547[4]
Weight Calibration Certificate Essential				
Primary Laboratory Reference Standard High precision standards for calibration of weights and special precision analytical balances accuracy Classes I and II (class number depending on precision).	E1			
	E2			
		0, 1		M, S
Weight Calibration Certificate Recommended				
High Accuracy Balances Working standard for precision analytical work, built-in weights and external weights used to calibrate moderate precision balances.	F1	2		
		3		S1
	F2			
Traceable Certificate Acceptable				
Industrial Scales & Balances Accuracy Class III industrial scales, dial scales, trip balances, platform scales. Also used for accuracy Class IIIL and IV, and weights used to calibrate scales in legal-for-trade applications.		4		P
	M1	5		Q
	M2	6	F	T
	M3			

[1] See pages 3-4 for more information on OIML weight classifications.
[2] See page 5 for more information on ASTM E617 weight classifications.
[3] See page 6 for more information on NIST 105-1 Class F weight classification.
[4] Listed for reference only. NBS Cir. 547 has been superseded by ASTM E617 classifications.

International Laboratory Weights & Precision Mass Standards Weight Classification (OIML)

Excerpts from the Standard Specification for Laboratory Weights and Precision Mass Standards as Regulated by the Organization Internationale De Metrologie Legale (OIML): 1994 Edition (E) Publication OIML R 111

This specification covers various classes of weights and mass standards used in laboratories, and weights used for field standards and commercial measurement.

OIML Weight Classification and Selection

OIML is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the National Metrological Services, or related organizations of member states.

The two main categories of OIML publications are:

1. International Recommendations (OIML R), which are model regulations that establish the metrological characteristics required of certain measuring instruments and which specify methods and equipment for checking their conformity; the OIML Member States shall implement these Recommendations to the greatest possible extent.

2. International Documents (OIML D), which are informative in nature and intended to improve the work of metrological services.

International Recommendations and International Documents are published in French (F) and English (E), and are subject to revision.

OIML publications may be obtained from the Organization's headquarters:

> Bureau International de Metrologie Legale
> 11, Rue Turgot - 75009 Paris - France
> Telephone: 33 (1) 48 78 12 82 and 42 85 27 11
> Fax: 33 (1) 42 82 17 27
> Telex: 234 444 SVP SERV F ATTN. OIML

General Information on Weight Classes: E1, E2, F1, F2, M1, M2

This Recommendation contains the principle physical characteristics and metrological requirements for weights which are used:

- For the verification of weighing instruments,
- For the verification of weights of a lower class of accuracy.

The nominal values of mass of the weights covered by this Recommendation range from 1 milligram (mg) to 50 kilograms (kg).

This Recommendation applies to weights in classes of accuracy as follows: E1, E2, F1, F2, M1, M2 and M3.

Weights used for the verification of weighing instruments

The classes of accuracy of the weights used for the verification of weighing instruments shall be specified in the appropriate International Recommendations relating to these instruments.

Weights used for the verification of weights of a lower class of accuracy

E1   Weights intended to ensure traceability (see OIML R 33, paragraph A.3) between national mass standards (with values derived from the International Prototype of the kilogram) and weights of class E2 and lower. Class E1 weights or sets of weights shall always be accompanied by a calibration certificate.

E2   Weights intended to be used for the initial verification of weights of class F1. They may be used as class E1 weights if they comply with the requirements for surface roughness and magnetic susceptibility of class E1 weights and if their calibration certificate gives the appropriate data.

F1   Weights intended to be used for the initial verification of weighs of class F2.

F2   Weights intended to be used for the initial verification of weights of class M1 and possibly M2.

M1 weights intended to be used for the initial verification of weights of class M2.

F1, F2 Weights used with instruments of accuracy class I.

F2   Weights intended to be used for important commercial transactions (e.g. gold and precious stones) on weighing instruments of accuracy class II.

M1   Weights intended to be used with weighing instruments of accuracy class II.

M2   Weights intended to be used in normal commercial transactions and on weighing instruments of accuracy class III.

M3   Weights intended to be used on weighing instruments of accuracy classes III and IIII.

The accuracy of weights used with weighing instruments shall be chosen in accordance with the requirements of OIML R 76 "Nonautomatic weighing instruments."

International Laboratory Weights & Precision Mass Standards Weight Classification (OIML)

Excerpts from the Standard Specification for Laboratory Weights and Precision Mass Standards as Regulated by the Organization Internationale De Metrologie Legale (OIML): 1994 Edition (E) Publication OIML R 111 (Continued)

Construction

Class E1 and E2 Weights

Class E1 and E2 weights shall be solid and have no cavity open to the atmosphere. They shall have an integral construction, i.e., consist of a single piece of material.

Class F1 and F2 Weights

Class F1 and F2 weights from 1 g to 50 kg may be one or more pieces from the same material. Class F1 and F2 weights may contain an adjusting cavity; however, the volume of this cavity shall not exceed one-fifth of the total volume of the weight, and the cavity shall be closed either by means of the lifting knob or by any other suitable device.

Calibration or Initial Verification

Certain categories of new weights may either be calibrated individually or be subject to initial verification, depending on their intended use and the national legislation of the country.

Calibration weights shall be accompanied by a certificate which gives at least the conventional mass of each weight, its expanded uncertainty and the value of the coverage factor k (see coverage factor k).

Class E1 weights shall always be accompanied by certificates.

The certificate for class E1 weights shall mention at least the values of conventional mass, the expanded uncertainty and the coverage factor k, and the density or volume for each weight.

The optional certificate for class E2 weights shall mention at least:

- The values of conventional mass of each weight and the extended uncertainty and the coverage factor k, or
- The information required for class E1 weights certificates (under the conditions of the above paragraph).

Recalibration or Periodic Verification

The categories of weights which are subject to calibration or initial verification should either be recalibrated or have a periodic verification. This makes it possible to verify that the weights maintain their metrological properties. Any weights found defective at the time of the periodic verification shall be discarded or readjusted.

Coverage Factor k - Level of Confidence

In most cases, it is appropriate to use the factor k=2.

For the Normal distribution, the factor k=2 signifies that the limits of expanded uncertainty apply when the confidence level is approximately 95%.

U.S. Laboratory Weights & Precision Mass Standards
Weight Classification (ASTM)

Excerpts from the Standard Specification for Laboratory Weights and Precision Mass Standards:
ASTM E 617

This specification covers various classes of weights and mass standards used in laboratories. Weights used for field standards and commercial measurement are excluded, as NIST Handbook 105-1 and NIST Handbook 44 cover those classes of weights.

Weight Classification and Selection

Selection of type and class depends upon the application of the weights. For primary standards, stability and information about the values of the weights is more important than the closeness of the values to nominal. Weights to be used with balances of low precision do not require small tolerances nor need the choice of materials to be limited to those of high stability. The suggested application table should serve as a guide in selecting weights for specific applications.

Type

Weights are divided into two types based upon the design:

Type I

These weights are of one-piece construction and contain no added adjusting material. They should be specified when weights are to be used as standards of the highest order and where maximum stability is required. A precise measurement of density can be made only for one-piece weights.

Type II

Weights of this type can be of any appropriate design such as screw knob, ring, or sealed plug. Adjusting material can be used as long as it is of a material at least as stable as the base material and is contained in such a way that it will not become separated from the weight.

Physical Characteristics

Class 0 must be Type I, one-piece construction, and classes 1-7 can be either Type I or II depending on the application. All weights must meet other design requirements for density, hardness, permitted surface area, surface finish, magnetic properties, corrosion resistance, surface protection and markings. Class selection depends upon the degree of stability required. Density limitations are important in minimizing the effects of air buoyancy in high precision measurements.

Class

Tolerance limitations are described in Classes 0, 1, 2, 3, 4, 5, 6 and 7 as shown in the weight tolerance tables. Classes with small numerical designations represent smaller tolerances. Classes 0, 1 and 2 are used primarily in metric but are also available in avoirdupois denominations. Classes 3, 4, 5, 6 and 7 include tolerances for metric, avoirdupois pound, avoirdupois ounce, troy ounce, pennyweight, and grain weights. Class 1 through 7 tolerances are comparable to those in the obsolete NIST Circular 547, Section 1, with the following exception: Class 1 replaces the smaller tolerances of Classes M and S, while Class 2 replaces the larger tolerances of Classes M and S.

Suggested Applications	Type	Class
Reference standards used for calibrating other weights	I	0, 1, 2, 3, or 4
High-precision standards for calibration of weights and precision balances	I or II	0, 1 or 2
Calibrating weights for balances with small on-scale ranges such as micro balances	I	0
Working standards for calibration and precision analytical work	I or II	2
Built-in weights, high-quality analytical balances	I or II	2
Moderate precision laboratory balances	II	3 or 4
External weights for balances of moderate precision:		
Weights less than or equal to 10 g	I or II	2
Weights greater than 10 g	I or II	2
Dial Scales and Trip Balances	II	4 or 5
Platform Scales	II	5 or 6

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U.S. Field Standard Weight Classification

Specification and Tolerances for Field Standard Weights (NIST Handbook 105-1, Class F, Revised 1990)

These specifications and tolerances are minimum requirements for standards used primarily to test weighing devices.

Key words: Field standard weights, specifications, test weights, tolerances, weights and measures inspection.

Introduction

A Class F field standard weight (after this, called "weight") is intended to be used primarily to test commercial weighing devices for compliance with the requirements of NIST Handbook 44[1]. Class F weights may be used to test most accuracy Class[2] III scales, all scales of Class IIIL or IIII, and scales not marked with a class designation.

A weight shall be verified to be within-tolerance prior to use. The within-tolerance status of a weight shall be rechecked as often as regulations or circumstances require, especially when damage to it is known or suspected.

General

These specifications apply to new weights placed in service after the publication of this standard; the tolerances apply to all weights in service.

A weight in service prior to the publication of this standard that has maintained Class F tolerances between verification tests shall continue to be acceptable.

The specifications permit the use of a weight at its nominal value in normal testing operations, where the tolerance on the item under test is at least three times as great as the tolerance of the weight[3].

A partial list of specifications from Handbook 105-1

1. Material

> 1.1 A weight made of brass or a fabricated weight (such as a laminated weight or a weight of nonuniform density) shall not be placed in service after the publication date of this standard (1990).

1.2 A weight smaller than 5 grams/0.01 lb shall be constructed of stainless steel, tantalum, nickel-chromium alloy, aluminum alloy, or other material sufficiently resistant to corrosion and oxidation that the surface need not be protected or coated.

1.3 A weight of 5 grams/0.01 lb up to and including 5 kg/10 lb shall be constructed of material having a hardness of Rockwell B 80 or greater (such as 300-series stainless steel), and be resistant to abrasion, corrosion, denting, and chipping.

1.4 A weight larger than 5 kg/10 lb shall be constructed of materials such as iron, steel, or stainless steel, have a hardness of Rockwell B 80 or greater, and be resistant to abrasion, corrosion, denting, and chipping. Cast iron may be used for weights 10 kg/20 lb and larger. Body filler (e.g., fiberglass, putty, or plaster) shall not be used to correct a poor casting or finish.

2. Finish

2.1 The surface finish of a new weight machined from round bar stock shall have a roughness average of 0.80 micrometers (32 microinches) or better, determined by use of a hand-held surface roughness indicator (available from several manufacturers) or more accurate method, and be free of scratches, dents, and chipped corners or edges, determined by visual examination. A beaded or blasted finish (with roughness average 1.25 micrometers (50 microinches) or better) is acceptable on a cube weight to facilitate gripping.

2.2 A weight 5 kg/10 lb or less shall not have a surface coating.

2.3 A weight larger than 5 kg/10 lb constructed of materials susceptible to corrosion or tarnishing shall have a protective surface coating. A light coat of sprayed-on flat aluminum paint is recommended. Lacquer is also acceptable. Epoxy paint or plated surfaces are not acceptable. A coating is recommended for the bottom of a weight, particularly if the bottom is recessed. If paint or lacquer is used, it shall be hard and resistant to chipping. Cast metric and avoirdupois field standards shall be color coded (i.e. gold for metric and silver for avoirdupois) to differentiate the weights.

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[1] NIST Handbook 44, Specifications Tolerances, and Other Technical Requirements for Weighing and Measuring Devices. (See current edition.)

[2] See Handbook 44, Section 2, Scales Code.

[3] See Handbook 44, Appendix A, par. 3.2.

Conversion Factors for Units of Mass   All shaded figures are exact

Units of Mass not greater than
Pounds and Kilograms

UNITS		GRAINS	APOTHECARIES SCRUPLES	PENNYWEIGHTS	AVOIRDUPOIS DRAMS	APOTHECARIES DRAMS	AVOIRDUPOIS OUNCES
1 grain	=	1	0.05	0.041 666 67	0.036 571 43	0.016 666 67	0.002 285 714
1 apoth. scruple	=	20	1	0.833 333 3	0.731 428 6	0.333 333 3	0.045 714 29
1 pennyweight	=	24	1.2	1	0.877 714 3	0.4	0.054 857 14
1 avdp. dram	=	27.343 75	1.367 187 5	1.139 323	1	0.455 729 2	0.062 5
1 apoth. dram	=	60	3	2.5	2.194 286	1	0.137 142 9
1 avdp. oz	=	437.5	21.875	18.229 17	16	7.291 667	1
1 apoth. or troy ounce	=	480	24	20	17.554 29	8	1.097 143
1 apoth. or troy pound	=	5760	288	240	210.651 4	96	13.165 71
1 avdp. lb	=	7000	350	291.666 7	256	116.666 7	16
1 milligram	=	0.015 432 36	0.000 771 617 9	0.000 643 014 9	0.000 564 383 4	0.000 257 206 0	0.000 035 273 96
1 gram	=	15.432 36	0.771 617 9	0.643 014 9	0.564 383 4	0.257 206 0	0.035 273 96
1 kilogram	=	15432.36	771.617 9	643.014 9	564.383 4	257.206 0	35.273 96

Units of Mass not greater than
Pounds and Kilograms

UNITS		APOTHECARIES OR TROY OUNCES	APOTHECARIES OR TROY POUNDS	AVOIRDUPOIS POUNDS	MILLIGRAMS	GRAMS	KILOGRAMS
1 grain	=	0.002 083 333	0.00 173 611 1	0.000 142 857 1	64.798 91	0.064 798 91	0.000 064 798 91
1 apoth. scruple	=	0.041 666 67	0.003 472 22	0.002 857 143	1295.978 2	1.295 978 2	0.001 295 978 2
1 pennyweight	=	0.05	0.004 166 667	0.003 428 571	1555.173 84	1.555 173 84	0.001 555 173 84
1 avdp. dram	=	0.056 966 15	0.004 747 179	0.003 906 25	1771.845 195 312 5	1.771 845 195 312 5	0.001 771 845 195 312 5
1 apoth. dram	=	0.125	0.010 416 67	0.008 571 429	3887.934 6	3.887 934 6	0.003 887 934 6
1 avdp. oz	=	0.911 458 3	0.075 954 86	0.062 5	28 349.523 125	28.349 523 125	0.028 349 523 125
1 apoth. or troy ounce	=	1	0.083 333 333	0.068 571 43	31 103.476 8	31.103 476 8	0.031 103 476 8
1 apoth. or troy pound	=	12	1	0.822 857 1	373 241.721 6	373.241 721 6	0.373 241 721 6
1 avdp. lb	=	14.583 33	1.215 278	1	453 592.37	453.592 37	0.453 592 37
1 milligram	=	0.000 032 150 75	0.000 002 679 229	0.000 002 204 623	1	0.001	0.000 0001
1 gram	=	0.032 150 75	0.002 679 229	0.002 204 623	1000	1	0.001
1 kilogram	=	32.150 75	2.679 229	2.204 623	1,000,000	1000	1

Units of Mass not greater than
Avoirdupois Ounces

UNITS		AVOIRDUPOIS OUNCES	AVOIRDUPOIS POUNDS	SHORT HUNDRED-WEIGHTS	SHORT TONS	LONG TONS	KILOGRAMS	METRIC TONS
1 avdp. oz	=	1	0.0625	0.000 625	0.000 031 25	0.000 027 901 79	0.028 349 523 125	0.000 028 349 523 125
1 avdp. lb	=	16	1	0.01	0.000 5	0.000 446 428 6	0.453 592 37	0.000 453 592 37
1 short hundredweight	=	1600	100	1	0.05	0.044 642 86	45.359 237	0.045 359 237
1 short ton	=	32,000	2000	20	1	0.892 857 1	907.184 74	0.907 184 74
1 long ton	=	35,840	2240	22.4	1.12	1	1016.046 908 8	1.016 046 908 8
1 kilogram	=	35.273 96	2.204 623	0.022 046 23	0.001 102 311	0.000 984 206 5	1	0.001
1 metric ton	=	35 273.96	2204.623	22.046 23	1.102 311	0.984 206 5	1000	1

Based on National Institute of Standards and Technology LC-1071, Factors for High-Precision Conversions, July 1976

Metric Weight Tolerances

INTERNATIONAL ORGANIZATION OF
LEGAL METROLOGY RECOMMENDATIONS
OIML R 111

ASTM E 617*

Denomi-nation Metric	E1 mg	E2 mg	F1 mg	F2 mg	M1 mg	M2 mg	M3 mg	0 mg	1 mg	2 mg
5000 kg										
3000 kg										
2000 kg										
1000 kg										
500 kg										
300 kg										
200 kg										
100 kg										
50 kg	25	75	250	750	2500	7500	25,000	63	125	250
30 kg								38	75	150
25 kg								31	62	125
20 kg	10	30	100	300	1000	3000	10,000	25	50	100
10 kg	5	15	50	150	500	1500	5000	13	25	50
5 kg	2.5	7.5	25	75	250	750	2500	6	12	25
3 kg								3.8	7.5	15
2 kg	1.0	3.0	10	30	100	300	1000	2.5	5.0	10
1 kg	0.5	1.5	5	15	50	150	500	1.3	2.5	5.0
500 g	0.25	0.75	2.5	7.5	25	75	250	0.60	1.2	2.5
300 g								0.38	0.75	1.5
200 g	0.1	0.30	1.0	3.0	10	30	100	0.25	0.50	1.0
100 g	0.05	0.15	0.5	1.5	5	15	50	0.13	0.25	0.50
50 g	0.03	0.10	0.30	1.0	3.0	10	30	0.060	0.12	0.25
30 g								0.037	0.074	0.15
20 g	0.025	0.080	0.25	0.8	2.5	8	25	0.037	0.074	0.10
10 g	0.020	0.060	0.20	0.6	2.0	6	20	0.025	0.050	0.074
5 g	0.015	0.050	0.15	0.5	1.5	5	15	0.017	0.034	0.054
3 g								0.017	0.034	0.054
2 g	0.012	0.040	0.12	0.4	1.2	4	12	0.017	0.034	0.054
1 g	0.010	0.030	0.10	0.3	1.0	3	10	0.017	0.034	0.054
500 mg	0.008	0.025	0.08	0.25	0.8	2.5		0.005	0.010	0.025
300 mg								0.005	0.010	0.025
200 mg	0.006	0.020	0.06	0.20	0.6	2		0.005	0.010	0.025
100 mg	0.005	0.015	0.05	0.15	0.5	1.5		0.005	0.010	0.025
50 mg	0.004	0.012	0.04	0.12	0.4			0.005	0.010	0.014
30 mg								0.005	0.010	0.014
20 mg	0.003	0.010	0.03	0.10	0.3			0.005	0.010	0.014
10 mg	0.002	0.008	0.025	0.08	0.25			0.005	0.010	0.014
5 mg	0.002	0.006	0.020	0.06	0.20			0.005	0.010	0.014
3 mg								0.005	0.010	0.014
2 mg	0.002	0.006	0.020	0.06	0.20			0.005	0.010	0.014
1 mg	0.002	0.006	0.020	0.06	0.20			0.005	0.010	0.014

NVLAP®

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NIST 105-1 Class F Tolerances are based on the 1990 revised tolerance structure used by State Weights & Measures.

ASTM E 617*

3 mg	4 g & mg	5 g & mg	6 g & mg	7 g & mg
	100 g	250 g		750 g
	60	150		450
	40	100		300
	20	50		150
	10	25	50 g	75
	6.0	15	30	45
	4.0	10	20	30
	2.0	5	10	15
500	1.0	2.5	5	7.5
300	600 mg	1.5	3	4.5
250	500	1.2		4.5
200	400	1.0	2	3.8
100	200	500 mg	1	2.2
50	100	250	500 mg	1.4
30	60	150	300	1.0
20	40	100	200	750 mg
10	20	50	100	470
5.0	10	30	50	300
3.0	6.0	20	30	210
2.0	4.0	15	20	160
1.0	2.0	9	10	100
0.60	1.2	5.6	7	
0.45	0.90	4.0	5	44
0.35	0.70	3.0	3	33
0.25	0.50	2.0	2	21
0.18	0.36	1.3	2	13
0.15	0.30	0.95	2	9.4
0.13	0.26	0.75	2	7.0
0.10	0.20	0.50	2	4.5
0.080	0.16	0.38	1	3.0
0.070	0.14	0.30	1	2.2
0.060	0.12	0.26	1	1.8
0.050	0.10	0.20	1	1.2
0.042	0.085	0.16		0.88
0.038	0.075	0.14		0.68
0.035	0.070	0.12		0.56
0.030	0.060	0.10		0.4
0.028	0.055	0.080		
0.026	0.052	0.070		
0.025	0.050	0.060		
0.025	0.050	0.050		

NIST HANDBOOKS 105-1   44

F g & mg	Accept mg	Maint mg	Denomination Metric
500 g			5000 kg
300			3000 kg
200			2000 kg
100			1000 kg
50			500 kg
30			300 kg
20			200 kg
10			100 kg
5.0			50 kg
3.0			30 kg
2.5			25 kg
2.0	750	1500	20 kg
1.0	500	1000	10 kg
500 mg	400	800	5 kg
300	250	500	3 kg
200	200	400	2 kg
100	125	250	1 kg
70	88	175	500 g
60	75	150	300 g
40	50	100	200 g
20	35	70	100 g
10	20	40	50 g
6.0	15	30	30 g
4.0	10	20	20 g
2.0	8	15	10 g
1.5	5	10	5 g
1.28	4	8	3 g
1.12	3	6	2 g
0.90	2	4	1 g
0.72	1.5	3.0	500 mg
0.61	1.0	2.0	300 mg
0.54	0.8	1.5	200 mg
0.43	0.5	1.0	100 mg
0.35	0.4	0.8	50 mg
0.29	0.3	0.6	30 mg
0.26	0.2	0.4	20 mg
0.21	0.15	0.3	10 mg
0.17	0.05	0.1	5 mg
0.14	0.05	0.1	3 mg
0.12	0.05	0.1	2 mg
0.10	0.05	0.1	1 mg

Tolerance for weights of denominations between those listed can be determined as follows:
- If the unit of measure is non-metric, convert the nominal value to a metric unit.
- For weights that are between those listed, the tolerance for the next lower weight shall be applied.

Avoirdupois Weight Tolerances

(Pounds)

| Denomination Pound | NIST HANDBOOKS | | |
	105-1	44	
Denomination Pound	F g & mg	Accept g & mg	Maint g & mg
10,000 lb	450 g		
5000 lb	230		
3000 lb	140		
2500 lb	110		
2000 lb	91		
1000 lb	45		
500 lb	23		
100 lb	4.5		
50 lb	2.3	1.6 g	3.2 g
40 lb		1.5	2.9
30 lb	1.4	1.3	2.6
25 lb	1.1	1.1	2.3
20 lb	910 mg	970 mg	1.9
15 lb		910	1.8
10 lb	450	810	1.6
9 lb		750	1.5
8 lb		680	1.4
7 lb		620	1.2
6 lb		550	1.1
5 lb	227	490	970 mg
4 lb		360	710
3 lb	136	290	580
2 lb	91	230	450
1 lb	70	160	320
0.5 lb	45		
0.3 lb	27		
0.2 lb	18		
0.1 lb	9.1		
0.05 lb	4.5		
0.03 lb	2.7		
0.02 lb	1.8		
0.01 lb	1.5		
0.005 lb	1.17		
0.003 lb	0.99		
0.002 lb	0.87		
0.001 lb	0.70		
0.0005 lb			
0.0003 lb			
0.0002 lb			
0.0001 lb			
0.00005 lb			
0.00003 lb			
0.00002 lb			
0.00001 lb			

(Ounces)

| Denomination Pound | NIST HANDBOOKS | | |
	105-1	44	
Denomination Pound	F g & mg	Accept g & mg	Maint g & mg
12 oz		160	320
10 oz		130	260
8 oz	45	130	260
6 oz		110	230
5 oz		110	230
4 oz	23	97	194
3 oz		65	130
2 oz	11	65	130
1 oz	5.4	55	110
1/2 oz	2.8	49	97
1/4 oz	1.7	32	65
1/8 oz	1.3	16	32
1/16 oz	1.1	13	26
1/32 oz	0.87	9.7	19
1/64 oz	0.69	3.2	6.5
0.5 oz	2.8		
0.3 oz	1.8		
0.2 oz	1.6		
0.1 oz	1.3		
0.05 oz	1.0		
0.03 oz	0.85		
0.02 oz	0.75		
0.01 oz	0.60		
0.005 oz			
0.003 oz			
0.002 oz			
0.001 oz			
0.0005 oz			
0.0003 oz			
0.0002 oz			
0.0001 oz			

NIST Handbook 44 & NIST Circular 3 Tolerances have been converted from avoirdupois to metric and rounded to two significant figures.

NIST 105-1 Class F Tolerances are based on the 1975 revised tolerance structure used by State Weights & Measures.