U.S. Laboratory Weights & Precision Mass Standards Weight Classification

Application Table

Class	Type	Application
0	I	Primary Laboratory Reference Standards
0	I	Reference standards used for calibrating Class 1 weights
0	I	Reference standards used for calibrating Class 2 weights
1	I	Reference standards used for calibrating Class 3 weights
1	II	Calibration weights used with calibration Class I balances
1	I or II	Built in weights for high quality analytical balances
1,2	I or II	Calibration weights used with calibration Class II balances, laboratory weights for rountine analytical work
2	I or II	Standards used for calibration Class 4 weights
3	I or II	Standards used for calibrating Class 5 weights
4	I or II	Standards used for calibrating Class 6 weights
4,5,6	I or II	Student laboratory use
5,6	I or II	Student laboratory use
7	I or II	Rough weighing operations in physical and chemical laboratories such as force measuring apparatus

Term Abbreviations

Name of Unit	Accepted Abbreviation	Conversion Factor (g/unit of measure)
Assay Ton	AT	29.1667 g
Carat	c	0.2 g
Dram, apothecaries'	dr ap	3.8879346 g
Grain, Troy	GN	0.06479891 g
Gram	g	1 g
Kilogram	kg	1000 g
Milligram	mg	0.001 g
Ounce, apothecaries (480 grains)	oz ap	31.1034768 g
Ounce, avoirdupois (437.5 grains)	oz	28.349523125 g
Ounce, troy (480 grains)	oz t	31.1034768 g
Pennyweight	dwt	1.55517384 g
Pound avoirdupois	lb	453.59237 g
Scruple, apothecaries'	s ap	1.2959782 g

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Reference

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, and 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 pr mary 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 0 weights shall not bear any indication of nominal value.

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.