


Basic Mass Metrology References

Publication	Related CD-ROM Section & Availability
19 th General Conference on Weights and Measures (CGPM) Report, Excerpts 1991	M2L1 Weights & Measures Reference CD
30-kg Voland Balance Operation (unpublished procedure)	M2L3 Weights & Measures Reference CD
ANSI/NCSL Z540.1-1994 (R2002), American National Standards Institute, National Conference of Standards Laboratories, American National Standard, General Requirements for Calibration Laboratories and Measuring and Test Equipment	M1L3, M2L2 http://www.ncsli.org
ASTM E 1270-88, Standard Test Method for Equal Arm Balances, Reapproved 1997	M2L3 http://www.astm.org
ASTM E 319-85, Standard Practice for the Evaluation of Single-Pan Mechanical Balances, Reapproved 1997	M2L3 http://www.astm.org
ASTM E 617-97, Standard Specification for Laboratory Weights and Precision Mass Standards, 1997	M1L4, M3L5 http://www.astm.org
ASTM E 898-88, Standard Method of Testing Top-Loading, Direct-Reading Laboratory Scales and Balances, Reapproved 2000	M2L3 http://www.astm.org
Cameron, J. M., Croarkin, M. C., Raybold, R. C., NBS Technical Note 952, Designs for the Calibration of Standards of Mass, June 1977	M2L2, M3L1 Weights & Measures Reference CD
Cook, S., Williams, J. Suiter, R., Grimes, T.L. editors, 2003 Edition, NIST Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices Excerpt: Sec. 2.20. Scales	M2L3 http://www.nist.gov/owm
Cook, S., Williams, J. Suiter, R., Grimes, T.L. editors, 2003 Edition, NIST Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices Excerpt: Appendix A, Fundamental Considerations Associated with the Enforcement of Handbook 44 Codes	M2L3 http://www.nist.gov/owm
Cook, S., Williams, J. Suiter, R., Grimes, T.L. editors, 2003 Edition, NIST Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices Excerpt: Appendix C, Units & Conversions	M1L1 http://www.nist.gov/owm
Davis, R. S., "Determining the Magnetic Properties of 1 kg Mass Standards", J. Res. Natl. Inst. Stand. Technol. 100, 209-225, January-February 1990	M3L5 Weights & Measures Reference CD
Davis, R. S., "Equation for the Determination of the Density of Moist Air (1981/91)", Metrologia, 1992, 29, 67-70	M2L1 Weights & Measures Reference CD
Davis, R. S., "New Assignment of Mass Values and Uncertainties to NIST Working Standards", J. Res. Natl. Inst. Stand. Technol. 95, 79-92, January-February 1990	M1L4 Weights & Measures Reference CD

Publication	Related CD-ROM Section & Availability
Davis, R. S., "Note on the Choice of a Sensitivity Weight in Precision Weighing", J. Res. Natl. Inst. Stand. Technol. 92, 239-242, May-June 1987	M2L4 Weights & Measures Reference CD
Davis, R.S., "Equation for the Determination of the Density of Moist Air (1981/91)", Metrologia, 1992, 29(1), 67-70	M2L1 Weights & Measures Reference CD
Eberhardt, K. R., Doiron, T. D., Phillips, S. D., Estler, W. T., Levenson, M. S., "A Careful Consideration of the Calibration Concept", J. Res. Natl. Inst. Stand. Technol., 106 (2), 371  (2001).	General http://nvl.nist.gov/index.cfm Weights & Measures Reference CD
EURACHEM/CITAC Guide, Quantifying Uncertainty in Analytical Measurement, Second Edition, QUAM:2000.P1, Editors: S L R Ellison (LGC, UK), M Rosslein (EMPA, Switzerland), A Williams (UK)	M1L4 Available on the Internet.
Everhart, J. L., Harris, G. L., NIST IR 6176, Process Measurement Assurance Program for U.S. State Metrology Laboratories, 1998	M1L3 Weights & Measures Reference CD
Farnum, N. R., Modern Statistical Quality Control and Improvement, Duxbury Press, Wadsworth Publishing Co., Belmont, CA, 1993	M1L3
Fluke Corporation, Calibration Philosophy in Practice, 2 nd Edition, 1994	M1L2, M1L3, M1L4, M2L1
Giacomo, P., "Equation for the Determination of the Density of Moist Air (1981)", Metrologia, 1982, 18, 33-40	M2L1 Weights & Measures Reference CD
Gläser, M., "Response of Apparent Mass to Thermal Gradients", Metrologia, 27, 95-100, 1990	M2L2
Harris, G. L., Commonly Asked Questions About Mass Standards, Cal Lab Magazine, 1995	M3L5 http://www.nist.gov/labmetrology Weights & Measures Reference CD
Harris, G. L., "Ensuring Accuracy and Traceability in Weighing Instruments", ASTM Standardization News, April 1993.	M2L3 Weights & Measures Reference CD
Harris, G. L., "Implementation of the Guide to the Expression of Uncertainty in Measurement for State Calibration Laboratories", NCSL Annual Workshop and Symposium, 1994	M1L4 Weights & Measures Reference CD
Harris, G. L., NIST Handbook 105-1, Specifications and Tolerances for Field Standard Weights and Measures, 1. Specifications and Tolerances for Field Standard Weights (NIST Class F)	M2L2, M3L5 http://www.nist.gov/labmetrology Weights & Measures Reference CD
Harris, G. L., NIST Handbook 143, State Weights and Measures Laboratories, Program Handbook, March 2003	M1L3, M2L1, M2L2, M3L1 http://www.nist.gov/labmetrology Weights & Measures Reference CD
Harris, G. L., Torres, J. T., GMP 11, Good Measurement Practice for Assignment and Adjustment of Calibration Intervals for Standards	M1L3 http://www.nist.gov/labmetrology See NIST IR 6969
Harris, G. L., Torres, J. T., GMP 12, Good Measurement Practice for the Standard Operating Procedure Selection	M2L1, M2L2, M3L1 http://www.nist.gov/labmetrology See NIST IR 6969

Publication	Related CD-ROM Section & Availability
Harris, G. L., Torres, J. T., GMP 13, Good Measurement Practice for Ensuring Traceability	M1L3 http://www.nist.gov/labmetrology See NIST IR 6969
Harris, G. L., Torres, J. T., GMP 14, Selection and Use of Sensitivity Weights in Weighing Procedures	M2L4 http://www.nist.gov/labmetrology See NIST IR 6969
Harris, G. L., Torres, J. T., NIST IR 6969, Selected Laboratory and Measurement Practices, and Procedures, to Support Basic Mass Calibrations, March 2003	All GLPs, GMPs, SOPs referenced on CBT http://www.nist.gov/labmetrology Weights & Measures Reference CD
Harris, G. L., Torres, J. T., SOP 2, Recommended Standard Operating Procedure for Applying Air Buoyancy Corrections	M2L1 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145, Taylor, J. K., Oppermann, H. V., 1986)
Harris, G. L., Torres, J. T., SOP 29, Standard Operating Procedure for the Assignment of Uncertainty	M1L4, M2L1 http://www.nist.gov/labmetrology See NIST IR 6969
Harris, G. L., Torres, J. T., SOP 30, Standard Operating Procedure for a Process Measurement Assurance Program	M1L3, M2L1, M2L2 http://www.nist.gov/labmetrology See NIST IR 6969
Harris, G. L., Torres, J. T., SOP 4, Recommended Standard Operations Procedure for Weighing by Double Substitution Using a Single-Pan Mechanical Balance, a Full Electronic Balance, or a Balance with Digital Indications and Built-In Weights	M1L4, M2L2, M2L4, M3L1, M3L4 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145, Taylor, J. K., Oppermann, H. V., 1986)
Harris, G. L., Torres, J. T., SOP 7, Recommended Standard Operations Procedure for Weighing by Single Substitution Using a Single-Pan Mechanical Balance, a Full Electronic Balance, or a Balance with Digital Indications and Built-In Weights	M1L1, M1L3, M2L4, M3L1, M3L2 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145, Taylor, J. K., Oppermann, H. V., 1986)
Harris, G. L., Torres, J. T., SOP 8, Recommended Standard Operations Procedure for Tolerance Testing of Mass Standards by Modified Substitution	M1L4, M2L4, M3L1, M3L3 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145, Taylor, J. K., Oppermann, H. V., 1986)
Harris, G. L., Torres, J. T., SOP 9, Recommended Standard Operations Procedure for Control Charts for Calibration of Mass Standards	M1L3, M2L1 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145, Taylor, J. K., Oppermann, H. V., 1986)
ILAC-G2:1994, Traceability of Measurements, 1996	M2L1
ISO Guide to the Expression of Uncertainty in Measurement (GUM), 1993	M1L4, M3L5
ISO/BIPM International Vocabulary of Basic and General Terms in Metrology (VIM)	M1L2, M1L4, M2L1, M3L1
ISO/IEC 17025, International Organization for Standardization, General Requirements for the Competence of Testing and Calibration Laboratories, 1999.	M1L2, M1L4, M2L2
Jabbour, Z. J., "Mass Metrology at NIST", 1997 NCSL Workshop & Symposium, p 433-443	M2L1, M2L2 Weights & Measures Reference CD
Jabbour, Z. J., Air91co24.exe; Fortran Air Density program according to CIPM 81/91	M2L1 Weights & Measures Reference CD

Publication	Related CD-ROM Section & Availability
Jabbour, Z. J., Yaniv, S. L., "The Kilogram and Measurements of Mass and Force", J. Res. Natl. Inst. Stand. Technol. 106, 25–46 (2001)	M2L1, M2L2 http://nvl.nist.gov/index.cfm Weights & Measures Reference CD
Jaeger, K. B., Davis, R. S., NBS Special Publication 700-1, A Primer for Mass Metrology, November 1984	M2L1, M3L1 Weights & Measures Reference CD
Jones, F. E., "The Air Density Equation and the Transfer of the Mass Unit", J. Res. Nat. Bur. Stand (U.S.), Vol. 83, No. 5, 419-428, September-October 1978	M2L1 Weights & Measures Reference CD
Jones, F. E., Schoonover, R. M., Handbook of Mass Measurement, CRC Press, Washington D.C., 2002	General/All
Kimothi, S. K. The Uncertainty of Measurements, Physical and Chemical Metrology Impact and Analysis, ASQ Quality Press, Milwaukee, WI, 2002	M1L4
Kochsiek, M., Gläser, M., Comprehensive Mass Metrology, Wiley-VCH, 2000	General/All
Kochsiek, M., Mettler-Toledo, Fundamentals of Mass Determination, 1991	M2L2
Ku, H. H., NBS Special Publication 300, Volume 1, Precision Measurement and Calibration, Statistical Concepts and Procedures, February 1969 Kruskal, W. H., "Some Remarks on Wild Observations" (3 pp, 346-1 to 348-3)	M1L3 Weights & Measures Reference CD
Ku, H. H., NBS Special Publication 300, Volume 1, Precision Measurement and Calibration, Statistical Concepts and Procedures, February 1969 Proschan, F., "Rejection of Outlying Observations" (6 pp, 349-520 to 354-525)	M1L3 Weights & Measures Reference CD
Lammi, T., Calibration of Weighing Instruments and Uncertainty of Calibration, OIML Bulletin Volume XLII, Number 4, October 2001	M1L4, M2L3
Lashof, T. W., Macurdy, L. B., NBS Circular 547, Section 1, Precision Laboratory Standards of Mass and Laboratory Weights, August 1954 (out of print; superseded in 1978 by ASTM E 617)	M3L5 Weights & Measures Reference CD
Lee, G. Diane editor, NIST HB 112, EPO No. 1 Rev 3/02 1-1 Examination Procedure Outline for Retail Computing Scales	M2L3 http://www.nist.gov/owm
Lee, G. Diane editor, NIST HB 112, EPO No. 13 Rev. 3/02 13-1 Examination Procedure Outline for Vehicle and Axle-Load Scales Mechanical-Analog Indicating (Weighbeams and Dials)	M2L3 http://www.nist.gov/owm
Mandel, J., Nanni, L. F., SP 700-2, Measurement Evaluation, March 1986	M1L2, M1L3 Weights & Measures Reference CD
Mettler-Toledo, Weighing the Right Way With METTLER TOLEDO, The proper way to work with electronic analytical and microbalances	M2L3
Miller, V., NIST IR 6919, Recommended Guide for Determining and Reporting Uncertainties for Balances and Scales, January 2002	M1L4, M2L3 http://www.nist.gov/labmetrology

Publication	Related CD-ROM Section & Availability
Natrella, M. G., NBS Handbook 91, Experimental Statistics, August 1963, reprinted with corrections October 1966 Chapter 17, "The Treatment of Outliers"	M1L2 Weights & Measures Reference CD
Natrella, M. G., NBS Handbook 91, Experimental Statistics, August 1963, reprinted with corrections October 1966 Chapter 18, "The Place of Control Charts in Experimental Work"	M1L2 Weights & Measures Reference CD
NBS LC 1071 July 1976 Factors for High-Precision Conversion, U.S. Customary and Metric Units	M1L1 Weights & Measures Reference CD
NCSL Recommended Practice RP-7: Laboratory Design, July 1993	M1L4, M2L2 M1L4 http://www.ncsli.org
NCSLI, Recommended Practice, RP 12, Determining and Reporting Measurement Uncertainties, February 1994	M1L4 http://www.ncsli.org
NCSLI, Recommended Practice, RP 14, Guide to Selecting Standards-Laboratory Environments, March 1999	M2L2 M1L4 http://www.ncsli.org
NIST/SEMATECH e-Handbook of Statistical Methods, http://www.itl.nist.gov/div898/handbook/ , July 2003.	M1L2, M1L3, M1L4 http://www.itl.nist.gov/div898/handbook/index.html
OIML R 111, 1994 E, Weights of Classes E ₁ , E ₂ , F ₁ , F ₂ , M ₁ , M ₂ , M ₃ (undergoing revision)	M1L4, M2L2, M2L3, M3L5
OIML R 33 (D 33) Conventional Value of The Result of Weighing in Air, 1979 (undergoing revision)	M2L1
OIML R 76-1 1992, Nonautomatic weighing instruments Part 1: Metrological and technical requirements – Tests	M2L3
Park, L. U., Care and Maintenance of the Russell Balance (unpublished procedure)	M2L3 Weights & Measures Reference CD
Pontius, P. E., Cameron, J. M., NBS Monograph 103, Realistic Uncertainties and the Mass Measurement Process, 1967	M1L4 Weights & Measures Reference CD
Pontius, P. E., NBS Monograph 133, Mass and Mass Values, January 1974	M1L4, M3L1 Weights & Measures Reference CD
Reichmuth, A. (Mettler-Toledo) Estimating Weighing Uncertainty From Balance Data Sheet Specifications, March 2000	M2L3
Reichmuth, A. (Mettler-Toledo) Measuring Mass & Force With A Balance, June 30, 1997	M2L3
Reichmuth, A. (Mettler-Toledo) Non-Linearity Of Laboratory Balances And Its Impact On Uncertainty, 2000 NCSLI Workshop & Symposium	M2L3
Reichmuth, A. (Mettler-Toledo), Adverse Influences And Their Prevention In Weighing, August 2001	M2L2
Reichmuth, A. (Mettler-Toledo), Influence Sources & Prevention In Weighing, August 2000	M2L2
Reichmuth, A. (Mettler-Toledo), Weighing Accuracy	M2L3

Publication	Related CD-ROM Section & Availability
With Laboratory Balances, Proc. 4th. Biennial Conference of Metrology Society of Australia, Oct. 2-4, 2001, Broadbeach (QLD, Au). pp. 38-44	
Schoonover, R. M., Davis, R. S., Driver, R. G., Bower, V. E., "A Practical Test of the Air Density Equation in Standards Laboratories at Differing Altitude", J. Res. Nat. Bur. Stand (U.S.), Vol. 85, No. 1, 27-38, January-February 1980	M2L1
Schoonover, R. M., Taylor, J. E., "Some Recent Developments at NMS in Mass Measurements", Reprinted from IEEE Transactions on Instrumentation and Measurement, Vol. IM-35, No. 4, Part 1, December, 1986	M2L2 Weights & Measures Reference CD
SI Diagram, NIST Physics website	M2L1 http://physics.nist.gov/cuu/Units/SIdiagram.html
Taylor, B. N., Kuyatt, C. E., NIST TN 1297, 1994 Edition, Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results, September 1994	M1L4, M3L5 http://physics.nist.gov/cuu/Uncertainty/bibliography.html Weights & Measures Reference CD
Taylor, J. K., Oppermann, H. O., NBS Handbook 145, Handbook for the Quality Assurance of Metrological Measurements, 1986	M1L2 http://www.nist.gov/labmetrology See NIST IR 6969 (Handbook 145 is out of print.)
United Kingdom Accreditation Service, UKAS Lab 12, The Expression of Uncertainty in Testing, October 2000	M1L4 Available on the Internet.
United Kingdom Accreditation Service, UKAS, Lab 14, Calibration of Weighing Machines, March 2001	M2L3 Available on the Internet.
USP 1251, Weighing on An Analytical Balance/General Information, Second Supplement, USP-NF	M2L3
USP 41 – In-Process Revision, Pharmacopeial Forum, Vol 26 (6), Nov-Dec 2000	M2L3
USP 41 – Weights and Balances 41 – Stimulus to Revisions, Vol 24 (1), Jan-Feb 1998	M2L3
Vetter, T. W., Quantifying Measurement Uncertainty In Analytical Chemistry – A Simplified Practical Approach	M1L4 http://www.intec.cl/documentos_linea/VetterKragten.pdf
White, V. R., Alderman, D. F. and Faison, C. D. Editors NIST Handbook 150, National Voluntary Laboratory Accreditation Program, Procedures Requirements and General Program Handbook, Supersedes NIST HB 150, 1994 edition, July 2001	M1L3, M2L1, M2L2 http://ts.nist.gov/ts/htdocs/210/214/214.htm
Youden, W. J., NBS SP 672, Experimentation and Measurement, 1961, Reprinted 1997	M1L2 http://ts.nist.gov/ts/htdocs/230/233/calibrations/ Weights & Measures Reference CD