Eurachem A FOCUS FOR ANALYTICAL CHEMISTRY IN EUROPE

Reading List for Analytical Scientists

Contents

Introduction and scope

This reading list has been prepared by members of the Eurachem Education and Training Working Group. It is based on bibliographies originally produced by TrainMiC® and LGC (in its role as the UK's National Measurement Laboratory and Designated Institute for chemical and bio-measurement, www.lgcgroup.com/nml) – but has been substantially updated. The main focus of the references contained in the list is metrology in chemistry, with a particular focus on quality assurance. However, it is anticipated that the references will also be of interest to those working in other disciplines. It is not intended to be a comprehensive list of all publications relating to quality in analytical measurement. The aim is to provide references to a selection of websites, standards, guides and books which will hopefully be of use to all those involved with chemical analysis (and related disciplines), including laboratory staff, students, lecturers and trainers.

Many of the references provided in this list are available to download free of charge, in particular documents published by Eurachem, JCGM, Euramet, Eurolab, ILAC, EA and accreditation bodies.

The aim is to update the bibliography annually. The Working Group welcomes suggestions for additions to the bibliography. Please send any additional references to the Working Group Chair (www.eurachem.org/index.php/component/contact/contact/60-ct-exec/10-execvjb).

Updates or additions are identified by a side bar.

Eurachem provides this list for information and is not responsible for the content or advice given in the resources listed.

Introduction to metrology and terminology

Websites and web resources

- CIPM Mutual recognition arrangement (MRA) of national measurement standards and of calibration and measurement certificates issued by national metrology institutes (www.bipm.org/en/cipm-mra/)
- ISO online browsing platform – access ISO standards, terms and definitions (www.iso.org/obp/ui/)
- VIM Definitions with Informative Annotations, JCGM-WG2 (http://jcgm.bipm.org/vim/en/index.html)

Standards

- BIPM, IEC, IFCC, ILAC, ISO, IUPAC, IUPAP, OIML. JCGM 200:2012 (JCGM 200:2008 with minor corrections), International vocabulary of metrology -- Basic and general concepts and associated terms (VIM3) (www.bipm.org) (Earlier version printed as ISO Guide 99:2007 (www.iso.org)
- ISO 80000-1:2009. Quantities and units -- Part 1: General (and Corrigendum 1:2011) (www.iso.org)

Guides

- V. Barwick, E. Prichard (Eds), Terminology in analytical measurement – Introduction to VIM3, Eurachem, 2011, ISBN 978 0 948926 29 7 (www.eurachem.org/index.php/publications/guides)
- A beginner's guide to measurement, v3, Good practice guide no. 118, NPL, 2010, ISSN: 1368-6550 (www.npl.co.uk)

- Metrology – In short, 3rd Edition, EURAMET, 2008 (www.euramet.org)
- The International System of Units (SI), 8th Edition, 2006 (updated in 2014) (www.bipm.org)

Books

- IUPAC Compendium of chemical terminology ('Gold Book'), 2007 (updated version available at http://goldbook.iupac.org)
- IUPAC Quantities, units and symbols in physical chemistry ('Green Book'), 3rd Edition, 2007, ISBN 978-0-85404-433-7 (www.iupac.org/fileadmin/user_upload/publications/e-resources/ONLINE-IUPAC-GB3-2ndPrinting-Online-Sep2012.pdf)
- IUPAC Compendium of analytical nomenclature, ('Orange Book'), 3rd Edition, 1997, ISBN 0-86542-615-5 (http://old.iupac.org/publications/analytical_compendium/)

Articles and reports

- Eurachem information leaflet
  - You talk, we understand – The way out of the tower of Babel [An introduction to measurement terminology] (2015) (www.eurachem.org/index.php/publications/leaflets)
- W. Horwitz, Nomenclature for sampling in analytical chemistry, Pure Appl. Chem., 1990, 62, 1193-1208 (www.degruyter.com/pac)
- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 76-2016, Chemical metrology
  - AMC TB 19-2005, Terminology – the key to understanding analytical science. Part 2: Sampling and sample preparation
  - AMC TB 13-2003, Terminology - the key to understanding analytical science. Part 1: Accuracy, precision and uncertainty

Traceability of measurement results

Standards

- ISO 8466-1:1990 Water quality -- Calibration and evaluation of analytical methods and estimation of performance characteristics -- Part 1: Statistical evaluation of the linear calibration function (www.iso.org)
- ISO 8466-2:2001 Water quality -- Calibration and evaluation of analytical methods and estimation of performance characteristics -- Part 2: Calibration strategy for non-linear second-order calibration functions (www.iso.org)
- ISO 11095:1996 Linear calibration using reference materials (www.iso.org)
- ISO 17511:2003. In vitro diagnostic medical devices -- Measurement of quantities in biological samples -- Metrological traceability of values assigned to calibrators and control materials (www.iso.org)
- ISO 18153:2003. In vitro diagnostic medical devices -- Measurement of quantities in biological samples -- Metrological traceability of values for catalytic concentration of enzymes assigned calibrators and control materials (www.iso.org)
- ISO/TS 28037:2010. Determination and use of straight-line calibration functions (www.iso.org)

Guides

- Calibration of weighing machines, LAB 14, Edition 5, UKAS, 2015 (www.ukas.com)
- Guidelines on the calibration of non-automatic weighing instruments, cg-18 Version 4.0, EURAMET, 11/2015, (www.euramet.org)
- N. Majcen, P. Taylor, T. Martišius, A. Menditto, M. Patriarca, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 2, 2011, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)
- N. Majcen, P. Taylor, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 1, 2010, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)
- Traceability: Volumetric apparatus, LAB 15 Edition 2, UKAS, 2009 (www.ukas.com)
- V. Barwick, S. Wood (Eds), Meeting the traceability requirements of ISO 17025: An analyst's guide, 3rd Edition, 2005 (www.lgcgroup.com/nml)
- Traceability in chemical measurement – A guide to achieving comparable results in chemical measurement, Eurachem/CITAC, 2003 (www.eurachem.org/index.php/publications/guides)
- V. Barwick, Preparation of calibration curves: A guide to best practice, LGC/VAM/2003/032, LGC, 2003 (www.lgcgroup.com/nml)

Books

- A.Moutzoglou, A.Kastania and S.Archonakis, Laboratory Management Information Systems – Current Requirements and Future Perspectives, IGI Global, 2014, ISBN 978-1-4666-6320-6
- P. De Bièvre, H. Günzler (Eds), Traceability of chemical measurement, Springer-Verlag, Heidelberg Berlin, 2005, ISBN 3642078834

Articles and reports

- F. Raposo, Evaluation of analytical calibration based on least-squares linear regression for instrumental techniques: A tutorial review, TRAC-Trend. Anal. Chem., 2016, 77, 167-185 (www.elsevier.com)
- P. De Bièvre, R. Dybkaer, A. Fajgelj, D. Brynn Hibbert, Metrological traceability of measurement results in chemistry: Concepts and implementation (IUPAC Technical Report), Pure Appl. Chem., 2011, 83 (10), 1873-1935 (www.degruyter.com/pac)
- Clinical and Laboratory Standards Institute, Metrological traceability and its implementation: a report, Joint IFCC-CLSI project, CLSI document, EP32-R (Formerly X05-R). CLSI, Wayne, Pennsylvania, USA, 2006 (Sample available from www.ifcc.org or www.clsi.org)
- K. Danzer, M. Otto, L. A. Currie, Guidelines for calibration in analytical chemistry, Part 2: Multispecies calibration, IUPAC Technical Report, Pure Appl. Chem., 2004, 76 (6), 1215-1225 (www.degruyter.com/pac)
- L. Cuadros-Rodriguez, L. Gamiz-Gracia, E. Almansa-Loèpez, J. Laso-Sanchez, Calibration in chemical measurement processes: 1. A metrological approach, TRAC-Trend. Anal. Chem., 2001, 20 (4), 195-206 (www.elsevier.com)
- C. D. Ehrlich, S. D. Rasberry, Metrological timelines in traceability, J. Res. Natl. Inst. Stand. Technol., 1998, 103, 93-105 (www.nist.gov)
- K. Danzer, L. A. Currie, Guidelines for calibration in analytical chemistry part 1: Fundamentals and single component calibration, IUPAC Recommendation 1998, Pure Appl. Chem., 1998, 70 (4), 993-1014 (www.degruyter.com/pac)
- Eurachem information leaflet
    - Metrological traceability of analytical results (2005, updated 2008) (www.eurachem.org/index.php/publications/leaflets)

Uncertainty of measurement

Standards

- BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML JCGM 100:2008, Evaluation of measurement data – Guide to the expression of uncertainty in measurement (GUM 1995 with minor corrections) (www.bipm.org) (Printed as ISO/IEC Guide 98-3:2008 (www.iso.org))
- JCGM has produced a number of supplements to accompany the GUM, available at www.bipm.org:
    - Evaluation of measurement data – The role of measurement uncertainty in conformity assessment, JCGM 106:2012
    - Evaluation of measurement data – Supplement 2 to the "Guide to the expression of uncertainty in measurement" – Extension to any number of output quantities, JCGM 102:2011
    - Evaluation of measurement data – An introduction to the "Guide to the expression of uncertainty in measurement" and related documents, JCGM 104:2009
    - Evaluation of measurement data – Supplement 1 to the "Guide to the expression of uncertainty in measurement" – Propagation of distributions using a Monte Carlo method, JCGM 101:2008
- ISO 11352:2012 Water quality -- Estimation of measurement uncertainty based on validation and quality control data (www.iso.org)
- ISO 21748:2017. Guidance for the use of repeatability, reproducibility and trueness estimates in measurement uncertainty estimation (www.iso.org)
- ISO/TS 21749:2005. Measurement uncertainty for metrological applications -- Repeated measurements and nested experiments (www.iso.org)
- ISO/TS 28037:2010 Determination and use of straight line calibration functions (www.iso.org)

Guides

- General Accreditation Guidance. Estimating and reporting measurement uncertainty of chemical test results, NATA, 2018 (www.nata.com.au)
- Decision rules applied to conformity assessment, Technical report No. 01/2017, EUROLAB, 2017 (www.eurolab.org)
- B. Magnusson, T. Näykki, H. Hovind, M. Krysell, Handbook for calculation of measurement uncertainty in environmental laboratories, Nordtest Report TR 537 ed 4:2017 (www.nordtest.info)
- R. Bettencourt da Silva, A. Williams (Eds), Setting and using target uncertainty in chemical measurement, Eurachem/CITAC, 2015, ISBN 978-989-98723-7-0 (www.eurachem.org/index.php/publications/guides)
- EA-4/02 M, Evaluation of the uncertainty of measurement in calibration, 2013 (www.european-accreditation.org)
- N. Majcen and V Gegevičius (Ed.), Analytical measurement: measurement uncertainty and statistics, 2012, European Commission, Joint Research Centre, ISBN 978-92-79-23071-4 (https://bookshop.europa.eu/en/home/)
- S. L. R. Ellison, A. Williams (Eds), Quantifying uncertainty in analytical measurement, 3rd Edition, Eurachem/CITAC, 2012, ISBN 978-0-948926-30-3 (www.eurachem.org/index.php/publications/guides)

- N. Majcen, P. Taylor, T. Martišius, A. Menditto, M. Patriarca, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 2, 2011, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)
- N. Majcen, P. Taylor, L. Benedik, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 1, 2010, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)
- ILAC-G8:03/2009, Guidelines on the reporting of compliance with specification (www.ilac.org)
- S. L. R. Ellison, A. Williams, Use of uncertainty information in compliance assessment, Eurachem/CITAC, 2007 (www.eurachem.org/index.php/publications/guides)
- M. H. Ramsey, S. L. R. Ellison (Eds), Eurachem/EUROLAB/CITAC/Nordtest/AMC Guide: Measurement uncertainty arising from sampling: a guide to methods and approaches, Eurachem, 2007 (www.eurachem.org/index.php/publications/guides)
- Measurement uncertainty revisited: Alternative approaches to uncertainty evaluation, Technical report No. 1/2007, EUROLAB, 2007 (www.eurolab.org)
- Guide to the evaluation of measurement uncertainty for quantitative tests results, Technical report No. 1/2006, EUROLAB, 2006 (www.eurolab.org)
- K. Jewell, Microbiological measurement uncertainty: A practical guide, CCFRA, 2004, ISBN 0 905942 66 3 (www.campdenbri.co.uk)
- EA-4/16 G, EA guidelines on the expression of uncertainty in quantitative testing, 2003 (www.european-accreditation.org)
- Measurement uncertainty in testing, Technical report No. 1/2002, EUROLAB, 2002 (www.eurolab.org)

Articles and reports

- A. C. Olivieri, N. M. Faber, J. Ferré, R. Boqué, J. H. Kalivas, H. Mark, Uncertainty estimation and figures of merit for multivariate calibration, IUPAC Technical Report, Pure Appl. Chem., 2006, 78(3), 633-661 (www.degruyter.com/pac)
- J. Kragten, Calculating standard deviations and confidence intervals with a universally applicable spreadsheet technique, Analyst, 1994, 119, 2161-2166 (www.rsc.org)
- Eurolab cookbooks (www.eurolab.org/cookbooks.aspx)
  - Doc No. 8.0, Determination of conformance with specifications or limit values with particular reference to measurement uncertainties – possible strategies, 2017
- Eurachem information leaflets (www.eurachem.org/index.php/publications/leaflets)
  - Setting target measurement uncertainty (2018)
  - Treatment of an observed bias (2017)
  - Using repeated measurements to improve the standard uncertainty (2nd edition, 2016)
  - Use of uncertainty information in compliance assessment (2009, updated 2010)
  - Important information to our customers concerning the quality of measurements (2000)
- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 71-2015, Sampling theory and sampling uncertainty
  - AMC TB 64-2014 Unbalanced robust ANOVA for the estimation of measurement uncertainty at reduced cost

- AMC TB 58-2014, Estimating sampling uncertainty – how many duplicate samples are needed?
- AMC TB 53-2012, Dark uncertainty
- AMC TB 42-2009, The importance, for regulation, of uncertainty from sampling
- AMC TB 40-2009, The duplicate method for the estimation of measurement uncertainty arising from sampling
- AMC TB 32-2008, Optimising your uncertainty - a case study
- AMC TB 26A-2008, Measurement uncertainty and confidence intervals near natural limits
- AMC TB 22-2006, Uncertainties in concentrations estimated from calibration experiments
- AMC TB 21A-2008, The estimation and use of recovery factors
- AMC TB 20-2005, Analytical and sampling strategy, fitness for purpose, and computer games
- AMC TB 16A-2004, What is uncertainty from sampling, and why is it important?
- AMC TB 15-2003, Is my uncertainty estimate realistic?

Statistics

Web resources

- NIST/SEMATECH e-Handbook of Statistical Methods (www.itl.nist.gov/div898/handbook/)
- StatSoft Electronic Statistics Textbook (www.statsoft.com/textbook/)

Standards

- ISO 3534-1:2006. Statistics -- Vocabulary and symbols -- Part 1: General statistical terms and terms used in probability (www.iso.org)
- ISO 3534-2:2006. Statistics -- Vocabulary and symbols -- Part 2: Applied statistics (www.iso.org)
- ISO 3534-3:2013. Statistics -- Vocabulary and symbols -- Part 3: Design of experiments (www.iso.org)
- ISO 3534-4:2014. Statistics -- Vocabulary and symbols -- Part 4: Survey sampling (www.iso.org)

Books

- J. N. Miller, J. C. Miller, R. D. Miller, Statistics and chemometrics for analytical chemistry, 7th Pearson Education, 2018, ISBN 1292186712
- J. V. Stone, Bayes' Rule: A Tutorial Introduction to Bayesian Analysis, Sebtel Press, 2013, ISBN 0956372848
- D. C. Montgomery, E. A. Peck, G. G. Vining, Introduction to linear regression analysis, 5th edition, Wiley, 2012, ISBN 978-0-470-54281-1
- D. P. Kroese, T. Taimre, Z. I. Botev, Handbook of Monte Carlo methods, Wiley, 2011, ISBN 978-0-470-17793-8
- M. Thompson and P. J. Lowthian, Notes on statistics and data quality for analytical chemists, Imperial College Press, 2011, ISBN 978-1848166172
- S. L. R. Ellison, V. J. Barwick, T. J. Duguid Farrant, Practical statistics for the analytical scientist: A bench guide, 2nd Edition, RSC, 2009, ISBN 978 0 85404 131 2
- E. Mullins, Statistics for the quality control chemistry laboratory, RSC, 2003, ISBN 978 0 85404 671 3

Articles and reports

- J. Kragten, Calculating standard deviations and confidence intervals with a universally applicable spreadsheet technique, Analyst, 1994, 119, 2161-2165 (www.rsc.org)
- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 82-2017, Are my data normal?
  - AMC TB 72-2016, AMC Datasets – a resource for analytical scientists
  - AMC TB 69-2015, Using the Grubbs and Cochran tests to identify outliers
  - AMC TB 57-2013, An introduction to non-parametric statistics
  - AMC TB 55-2013, Experimental design and optimisation (4): Plackett-Burman designs
  - AMC TB 52-2013, Bayesian statistics in action
  - AMC TB 50-2012, Robust regression: An introduction

- AMC TB 39-2009, Rogues and suspects: How to tackle outliers
- AMC TB 38-2009, Significance, importance and power
- AMC TB 37-2009, Standard additions: myth and reality
- AMC TB 36-2009, experimental design and optimisation (3): some fractional factorial designs
- AMC TB 30-2008, The standard deviation of the sum of several variables
- AMC TB 27-2007, Why are we weighting?
- AMC TB 26-2006, Experimental design and optimisation (2): Handling uncontrolled factors
- AMC TB 24-2006, Experimental design and optimisation (1): An introduction to some basic concepts
- AMC TB 23-2006, Mixture models for describing multimodal data
- AMC TB 14-2003, A glimpse into Bayesian statistics
- AMC TB 10-2002, Fitting a linear functional relationship to data with error on both variables
- AMC TB 08-2001, The Bootstrap: A Simple Approach to Estimating Standard Errors and Confidence – Intervals when Theory Fails
- AMC TB 06-2001, Robust statistics: a method of coping with outliers
- AMC TB 04-2001 (revised March 2006), Representing data distributions with kernel density estimates

Validation of analytical methods

Standards

- ASTM E1169 – 18. Standard practice for conducting ruggedness tests. ASTM International (www.astm.org)
- ISO 5725-1:1994. Accuracy (trueness and precision) of measurement methods and results -- Part 1: General principles and definitions (and Corrigendum 1:1998) (www.iso.org)
- ISO 5725-2:1994. Accuracy (trueness and precision) of measurement methods and results -- Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method (and Technical Corrigendum 1:2002) (www.iso.org)
- ISO 5725-3:1994. Accuracy (trueness and precision) of measurement methods and results -- Part 3: Intermediate measures of the precision of a standard measurement method (and Corrigendum 1:2001) (www.iso.org)
- ISO 5725-4:1994. Accuracy (trueness and precision) of measurement methods and results -- Part 4: Basic methods for the determination of the trueness of a standard measurement method (www.iso.org)
- ISO 5725-5:1998. Accuracy (trueness and precision) of measurement methods and results -- Part 5: Alternative methods for the determination of the precision of a standard measurement method (and Corrigendum 1: 2005) (www.iso.org)
- ISO 5725-6:1994. Accuracy (trueness and precision) of measurement methods and results -- Part 6: Use in practice of accuracy values (and Corrigendum 1: 2001) (www.iso.org)
- ISO 11843-1:1997. Capability of detection -- Part 1: Terms and definitions (and Technical Corrigendum 1: 2003) (www.iso.org)
- ISO 11843-2: 2000. Capability of detection -- Part 2: Methodology in the linear calibration case (and Technical Corrigendum 1:2007) (www.iso.org)
- ISO 11843-5:2008. Capability of detection -- Part 5: Methodology in the linear and non-linear calibration cases (and Amendment 1:2017) (www.iso.org)
- ISO/TR 13843:2017. Water quality -- Requirements for establishing performance characteristics of quantitative microbiological methods (www.iso.org)
- ISO/TR 22971:2005. Accuracy (trueness and precision) of measurement methods and results -- Practical guidance for the use of ISO 5725-2:1994 in designing, implementing and statistically analysing interlaboratory repeatability and reproducibility results (www.iso.org)

Guides

- B. Magnusson, U. Örnemark (Eds), The fitness for purpose of analytical methods. A laboratory guide to method validation and related topics, 2nd Edition, Eurachem, 2014, (ISBN 978-91-87461-59-0) (www.eurachem.org/index.php/publications/guides)
- Guidelines for validation of qualitative binary chemistry methods, AOAC International Stakeholder Panel on Alternative Methods, Approved March 14, 2013 (www.aoac.org)
- Protocols for Determination of Limits of Detection and Limits of Quantitation; Approved Guideline Second Edition (EP17-A2), CLSI, 2012 (www.clsi.org)
- N. Majcen, P. Taylor, T. Martišius, A. Menditto, M. Patriarca, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 2, 2011, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)

- N. Majcen, P. Taylor, L. Benedik, Practical examples on traceability, measurement uncertainty and validation in chemistry Vol 1, 2010, European Commission, Joint Research Centre (https://bookshop.europa.eu/en/home/)
- AOAC International. How to Meet ISO 17025 Requirements for Method Verification. AOAC/ ALACC, 2007 (www.aoac.org)
- ICH Validation of Analytical Procedures :Text and Methodology Q2(R1) 2005 (www.ich.org)

Books

- M. L. J. Weitzel, W. M. Johnson, Application of ISO/IEC 17025 technical requirements in industrial laboratories: Method validation, FriesenPress, 2013, ISBN 978 1460210277
- M. E. Swartz, I. S. Krull, Handbook of analytical validation, CRC Press, 2012, ISBN 978 0824706890
- L. Huber, Validation and qualification in analytical laboratories, 2nd Edition, Informa Healthcare, 2007, ISBN 978 0849382673
- In-house method validation: A guide for chemical laboratories, LGC, 2003, ISBN 0 948926 18 X (www.lgcgroup.com/nml)
- C. Burgess, Valid analytical methods and procedures, RSC, 2000, ISBN 978 0 85404 482 5

Articles and reports

- D. T. Burns, K. Danzer, A. Townshend. Use of the term "recovery" and "apparent recovery" in analytical procedures, IUPAC Recommendation 2002, Pure Appl. Chem., 2002, 74(11), 2201-2205 (www.degruyter.com/pac)
- M. Thompson, S. L. R. Ellison, R. Wood, Harmonised guidelines for single-laboratory validation of methods of analysis, IUPAC Technical report, Pure Appl. Chem., 2002, 74 (5), 835-855 (www.degruyter.com/pac)
- J. Vessman, R. I. Stefan, J. Van Staden, K. Anzer, W. Lindner, D. Thorburn Burns, A. Fajgelj, H. Müller. Selectivity in analytical chemistry, IUPAC Recommendation 2001, Pure Appl. Chem., 2001, 73(8), 1381-1386 (www.degruyter.com/pac)
- M. Thompson, S. L. R. Ellison, A. Fajgelj, P. Willetts, R. Wood, Harmonized guidelines for the use of recovery information in analytical measurement, ISO, IUPAC and AOAC International Technical report, Pure Appl. Chem., 1999, 71 (2), 337-348 (www.degruyter.com/pac)
- L. A. Currie, Nomenclature in evaluation of analytical methods including detection and quantification capabilities, IUPAC Recommendations 1995, Pure Appl. Chem., 1995, 67(10), 1699-1723 (www.degruyter.com/pac) (also available in Analytica Chimica Acta, 1999, 391,105-126)
- W. Horwitz, Protocol for the design, conduct and interpretation of method performance studies, Pure Appl. Chem., 1995, 67, 331-343 (www.degruyter.com/pac)
- Eurolab cookbooks (www.eurolab.org/cookbooks.aspx)
  - Doc No. 1.0, Validation of test and calibration methods, 2017
  - Doc No. 15, The assessment of trueness of a measurement procedure by use of a reference material (RM), 2013
- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 70-2015, An analyst's guide to precision

- AMC TB 17-2004, The amazing Horwitz function
- AMC TB 13-2003, Terminology - the key to understanding analytical science. Part 1: Accuracy, precision and uncertainty
- AMC TB 05-2001, What should be done with results below the detection limit? Mentioning the unmentionable
- AMC TB 03-2005 (revised December 2005), Is my calibration linear?

Reference materials

Websites and web resources

- COMAR international database for certified reference materials (www.comar.bam.de/en/)

Standards

- ISO Guide 30:2015. Reference materials -- Selected terms and definitions (www.iso.org)
- ISO Guide 31:2015. Reference materials -- Contents of certificates and labels (www.iso.org)
- ISO Guide 33:2015. Reference materials -- Good practice in using reference materials (www.iso.org)
- ISO 17034:2016. General requirements for the competence of reference material producers (www.iso.org)
- ISO Guide 35:2017. Reference materials -- Guidance for characterization and assessment of homogeneity and stability (www.iso.org)
- ISO Guide 80:2014. Guidance for the in-house preparation of quality control materials (QCMs) (www.iso.org)
- ISO/TR 79:2015. Reference materials - Examples of reference materials for qualitative properties (www.iso.org)
- ISO/TR 10989:2009. Reference materials -- Guidance on, and keywords used for, RM categorization (www.iso.org)
- ISO 11095:1996. Linear calibration using reference materials (www.iso.org)
- ISO 15194:2009. In vitro diagnostic medical devices -- Measurement of quantities in samples of biological origin -- Requirements for certified reference materials and the content of supporting documentation (www.iso.org)

Guides

- The Selection and use of Reference Materials, EEE/RM/062rev3, Eurachem, 2002 (www.eurachem.org/index.php/publications/guides)

Books

- M. Stoeppler, W.R. Wolf, P.J. Jenks (eds.), Reference materials for chemical analysis – certification, availability and proper usage, Wiley-VCH, 2001, ISBN 3-527-30162-3
- A. Zschunke (ed.), Reference materials in analytical chemistry – a guide for selection and use, Springer, 2000, ISBN 3-540-66776-8

Articles and reports

- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 17A-2008, Test for ‘sufficient homogeneity’ in a reference material

Proficiency testing

Websites and web resources

- Eptis Proficiency Scheme database (www.eptis.bam.de/en/index.htm)

Standards

- ISO 13528:2015. Statistical methods for use in proficiency testing by interlaboratory comparisons (www.iso.org)
- ISO/IEC 17043:2010. Conformity assessment -- General requirements for proficiency testing (www.iso.org)

Guides

- EA-4/21 INF: 2018, Guidelines for the assessment of interlaboratory comparisons with few participants organised by laboratories and measurement audits by accreditation bodies in the process of laboratory accreditation (www.european-accreditation.org)
- EA-2/18 INF: 2015, Guidelines for accreditation bodies on the contents of the scopes of accreditation for proficiency testing providers (www.european-accreditation.org)
- I. Mann, B. Brookman (Eds), Selection, use and interpretation of proficiency testing (PT) schemes by laboratories, 2nd Edition, Eurachem, 2011 (www.eurachem.org/index.php/publications/guides)
- EA-4/18 INF: 2010, Guidance on the level and frequency of proficiency testing participation, (www.european-accreditation.org)

Articles and reports

- ILAC B6:01/2018, Benefits for laboratories participating in proficiency testing programs (www.ilac.org)
- I. Kuselman, A. Fajgelj, IUPAC/CITAC Guide: Selection and use of proficiency testing schemes for a limited number of participants – chemical analytical laboratories (IUPAC Technical Report). Pure Appl. Chem., 2010, 82(5), 1099-1135 (www.degruyter.com/pac)
- M. Thompson, S. L. R. Ellison, R. Wood, The International Harmonized Protocol for the proficiency testing of analytical chemistry laboratories, IUPAC Technical Report, Pure Appl. Chem., 2006, 78(1), 145-196 (www.degruyter.com/pac)
- Eurolab cookbooks (www.eurolab.org/cookbooks.aspx)
  - Doc No. 2.0, Criteria for the selection of a proficiency testing scheme, 2017
  - Doc No. 4.2, Use of interlaboratory comparison data by laboratories
- Eurachem information leaflets (www.eurachem.org/index.php/publications/leaflets)
  - Proficiency testing - how much and how often? (2017)
  - Selecting the right proficiency testing scheme for my laboratory (2015)
  - How can proficiency testing help my laboratory? (2013)
  - Pre- and post-analytical PT (2009)
  - Proficiency testing schemes and other interlaboratory comparisons (2005)

- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 78-2017 Proficiency testing of sampling
  - AMC TB 74-2016, z-Scores and other scores in chemical proficiency testing - their meanings, and some common misconceptions
  - AMC TB 68-2015, Fitness for purpose: the key feature in analytical proficiency testing
  - AMC TB 56-2013, What causes most errors in chemical analysis?
  - AMC TB 19A-2008, General and specific fitness functions for proficiency tests and other purposes – clarifying an old idea
  - AMC TB 18A-2005, What is proficiency testing? Guide for end-users of chemical data
  - AMC TB 18-2004, GMO Proficiency testing: Interpreting z-scores derived from log-transformed data
  - AMC TB 16-2004 (revised April 2007), Proficiency testing: assessing z-scores in the longer term
  - AMC TB 11-2002, Understanding and acting on scores obtained in proficiency testing schemes
  - AMC TB 02-2000 (revised December 2005), How to combine proficiency test results with your own uncertainty estimate - the zeta score

Internal quality control

Standards

- ISO Guide 80:2014. Guidance for the in-house preparation of quality control materials (QCMs) (www.iso.org)
- ISO 7870-1:2014. Control charts -- Part 1: General guidelines (www.iso.org)
- ISO 7870-2:2013. Control charts -- Part 1: Shewhart control charts (www.iso.org)
- ISO 7870-3:2012. Control charts -- Part 3: Acceptance control charts (www.iso.org)
- ISO 7870-4:2011. Control charts -- Part 4: Cumulative sum charts (www.iso.org)
- ISO/TS 13530:2009. Water quality -- Guidance on analytical quality control for chemical and physicochemical water analysis (www.iso.org)

Guides

- Internal Quality ConTROLL, Handbook for chemical laboratories, Edition 5.1, Nordtest Report TR569, 2018 (www.nordtest.info)

Articles and reports

- M. Thompson, B. Magnusson, Methodology in internal quality control of chemical analysis, Accred. Qual. Assur., 2013, 18, 271-278 (www.link.springer.com)
- M. J. Gardner, Quality control techniques for chemical analysis: some current shortcomings and possible future developments, Accred. Qual. Assur., 2007, 12, 653-657 (www.link.springer.com)
- M. Thompson, R. Wood, Harmonized guidelines for internal quality control in analytical chemistry laboratories, Pure Appl. Chem., 1995, 67, 49-56 (www.degruyter.com/pac)
- AMC Technical Briefs, RSC,(www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 51-2012, Quality control of routine sampling in chemical analysis
  - AMC TB 49-2011, Sporadic blunders
  - AMC TB 46-2010, Internal quality control in routine analysis
  - AMC TB 12-2003, The J-chart: a simple plot that combines the capabilities of Shewhart and cusum charts, for use in analytical quality control
  - AMC TB 09-2001, A simple fitness-for-purpose control chart based on duplicate results obtained from routine test materials

Quality assurance and accreditation

Standards

- ISO 13485:2016 Medical devices -- Quality management systems -- Requirements for regulatory purposes (www.iso.org/)
- ISO 78-2:1999. Chemistry -- Layouts for standards -- Part 2: Methods of chemical analysis (www.iso.org)
- ISO 9000:2015. Quality management systems -- Fundamentals and vocabulary (www.iso.org)
- ISO 9001:2015. Quality management systems – Requirements (www.iso.org)
- ISO 9004:2018. Quality management -- Quality of an organization -- Guidance to achieve sustained success (www.iso.org)
- ISO 15189:2012. Medical laboratories -- Requirements for quality and competence (www.iso.org)
- ISO 15193:2009. In vitro diagnostic medical devices -- Measurement of quantities in samples of biological origin -- Requirements for content and presentation of reference measurement procedures (www.iso.org)
- ISO 15194:2009. In vitro diagnostic medical devices -- Measurement of quantities in samples of biological origin -- Requirements for certified reference materials and the content of supporting documentation (www.iso.org)
- ISO 15195:2003. Laboratory medicine -- Requirements for reference measurement laboratories (www.iso.org)
- ISO/IEC 17000:2004. Conformity assessment. Vocabulary and general principles (www.iso.org)
- ISO/IEC 17011:2017. Conformity assessment -- Requirements for accreditation bodies accrediting conformity assessment bodies (www.iso.org)
- ISO/IEC 17024:2012. Conformity assessment -- General requirements for bodies operating certification of persons (www.iso.org)
- ISO/IEC 17025:2017. General requirements for the competence of calibrating and testing laboratories (www.iso.org)

Guides

- Handbook ISO/IEC 17025:2017, Eurolab, 2017 (www.eurolab.org/cookbooks)
- Tool for Transition from ISO 17025 2005 to 2017, Eurolab. 2017 (www.eurolab.org/cookbooks)
- V. Barwick (Ed), Guide to quality in analytical chemistry: An aid to accreditation, 3rd Edition, Eurachem/CITAC, 2016, ISBN 978-0-948926-32-7 (www.eurachem.org/index.php/publications/guides)
- Accreditation A tool to support regulators, European cooperation for Accreditation of Laboratories, 2016 (www.european-accreditation.org)
- ILAC-G19:08/2014, Modules in a forensic science process (www.ilac.org)
- M. Eleftheriadou, K. C. Tsimillis (Eds), Eurachem guide: Accreditation for laboratories performing microbiological testing, 2nd Edition, Eurachem, 2013 (www.eurachem.org/index.php/publications/guides)
- ILAC G18:04/2010, Guideline for the Formulation of Scopes of Accreditation for Laboratories (www.ilac.org)

- EA-2/15 M:2008, EA Requirements for the accreditation of flexible scopes, rev 00, July 2008 (www.european-accreditation.org)
- Guidance on the implementation and management of flexible scopes of accreditation within laboratories, LAB 39, Edition 1, UKAS, 2004 (www.ukas.com)
- UKAS Guidance on the application of ISO/IEC 17025 dealing with expressions of opinions and interpretations, LAB 13, Edition 2, UKAS, 2001 (www.ukas.com)
- Quality assurance for research and development and non-routine analysis, Eurachem/CITAC, 1998 (www.eurachem.org/index.php/publications/guides)

Books

- B. W. Wenclawiak, M. Koch, E. Hadjicostas, Quality assurance in analytical chemistry: Training and teaching, 2nd Edition, Springer, 2010, ISBN 978 3642136085
- E Prichard, V Barwick, Quality assurance in analytical chemistry, Wiley, 2007, ISBN 978-0-470-01204-8
- W. Funk, V. Dammann, G. Donnevert, S. Iannelli, E. Iannelli, Quality Assurance in Analytical Chemistry: Applications in Environmental, Food and Materials Analysis, Biotechnology and Medical Engineering, Wiley VCH, 2006, ISBN 978-3527311149
- D. B. Hibbert, J. J. Golding, Quality assurance in the analytical chemistry laboratory, Oxford University Press, 2006, ISBN 0195162129
- G. E. Baiulescu, R.-I. Stefan, H. Y. Aboul-Enein, Quality and reliability in analytical chemistry (Analytical Chemistry Series), CRC Press Inc, 2000, ISBN 978 0849323762
- F. Garfield, M. E. Klesta, J. Hirsch, Quality assurance principles for analytical laboratories, 3rd Edition, AOAC International, 2000, ISBN 0 935584 70 6
- J. Kenkel, A primer on quality in the analytical laboratory, Lewis Publishers, 1999, ISBN 1 566 70516 9

Articles and reports

- Eurachem information leaflets (www.eurachem.org/index.php/publications/leaflets)
  - ISO/IEC 17025:2017 - A New Accreditation Standard (2018)
- Eurolab cookbooks (www.eurolab.org/cookbooks.aspx)
  - Doc No. 6.0, How to assess the competence of staff, 2017
  - Doc No. 7.0, Management reviews for laboratories, 2017
  - Doc No. 9.0, Internal audits, 2017
  - Doc No. 10, Internal audits, the auditor, 2017
  - Doc No. 14, Internal audits, audit report, 2011
  - Doc No. 16, Corrective action, 2017
- AMC Technical Briefs, RSC, (www.rsc.org/Membership/Networking/InterestGroups/Analytical/AMC/TechnicalBriefs.asp):
  - AMC TB 28-2007, Using analytical instruments and systems in a regulated environment