News from the JCGM-WG1

MEETINGS The JCGM-WG1 meets normally twice per year, one of the meetings being held face-to-face, normally at the BIPM. Other online meetings devoted to specific subjects are held when needed, typically with a reduced number of members. The list of meetings can be consulted here.

MEMBERSHIP Clemens Elster from PTB, representing IUPAP within JCGM-WG1, passed away in 2025. He is greatly missed for his outstanding contribution to the WG activity and above all for his human qualities. His place as IUPAP representative is taken by Katy Klauenberg, as well from PTB. Olivier Pellegrino, from IPQ Portugal, joined in October 2025 as IEC representative.

Complete membership can be found here.

GUIDE TO THE EXPRESSION OF UNCERTAINTY IN MEASUREMENT - NEW PERSPECTIVE

Under the New Perspective, "the GUM" is the whole suite of documents published by the JCGM-WG1, thus broadening the scope of the first edition of that fundamental document. Two documents, JCGM GUM-1 and JCGM GUM-6, have been published so far (see below). Existing documents, suitably updated, will be renumbered and re-published as parts of the suite and new parts will be added to meet the evolving needs in the field of measurement uncertainty evaluation. To cite just an instance, there is a growing awareness that the result of the examination of nominal properties is not complete without a statement concerning the measurement uncertainty associated with the examination.

DOCUMENTS IN PREPARATION

JCGM GUM-5:202x Guide to the expression of uncertainty in measurement – Part 5: Examples of uncertainty evaluation

The idea of a separate evolving examples document was endorsed by the JCGM. This choice will allow greater flexibility whenever new examples will be made available. The examples will illustrate various methods of measurement uncertainty evaluation, thus concerning the whole suite of documents published by JCGM-WG1. They will also cover various areas of measurement.

JCGM GUM-5 is considered as an informative document in the GUM suite and as such has special status regarding the approval process of its updates following the first publication. The latter would contain an initial set of examples and will be subject to the usual approval procedure, whereas the subsequent updates including new examples will undergo a simplified procedure.

A first Committed Draft containing 16 examples was circulated among member organisations and NMIs in December 2024. Comments and suggestions were discussed and implemented by WG1 and the final Committee Draft is circulating among MOs for approval.

JCGM GUM-7:202x Guide to the expression of uncertainty in measurement – Part 7: Propagation of distributions using a Monte Carlo method

This document will be the re-publication of JCGM 101:2008 (see under "Publications" below) in the new perspective. The parent document, JCGM 101:2008, is being revised both editorially and technically. An advanced working draft is under discussion. It is expected that a first Committee Draft will be circulated for comments within spring 2026.

Amendment to JCGM 100:2008 Guide to the expression of uncertainty in measurement (GUM 1995 with minor corrections)

An inconsistency was identified in JCGM 100:2008, concerning the treatment of models in which the non-linearity is such that higher-order terms in the Taylor expansion at the base of the law of propagation of uncertainty must be considered. An Amendment with an accompanying Motivation were circulated and comments received. The final circulation started in December 2025.

OTHER BUSINESS

- **Definitions of terms related to measurement uncertainty.** JCGM-WG1 held several extra meetings devoted to the specific topic of definitions of terms related to measurement uncertainty, to be offered to JCGM-WG2. Joint WG1-WG2 meetings were held trying to establish a consensus on the key definitions. Those that were discussed are

measurement uncertainty
uncertainty of measurement

doubt about the value of the measurand that remains after making a measurement

NOTE 1 Measurement uncertainty can be described fully and quantitatively by a probability distribution on the set of possible values of the measurand.

NOTE 2 For scalar measurands, measurement uncertainty can be summarised by, for example, the standard uncertainty, a coverage interval with specified coverage probability, or by selected quantiles of the probability distribution in Note 1. For multivariate measurands, measurement uncertainty can be described, for example, by the covariance matrix or by a coverage region, with specified coverage probability.

standard uncertainty
standard measurement uncertainty

measurement uncertainty expressed by a standard deviation

coverage interval

interval believed to contain the value of the measurand with stated probability

NOTE Generally there is more than one coverage interval for a stated probability.

coverage probability

probability chosen in constructing a coverage interval or a coverage region

expanded uncertainty
expanded measurement uncertainty

half width of a coverage interval symmetric about the measured value

NOTE An expanded uncertainty can be obtained as the product of the standard uncertainty and a coverage factor.

coverage factor

numerical factor used to multiply the standard uncertainty to obtain an expanded uncertainty

NOTE 1 A coverage factor is chosen to give an intended coverage probability.

NOTE 2 For a normal distribution, a coverage factor $k = 2$ gives a coverage probability of approximately 95 %.

relative standard uncertainty
relative standard measurement uncertainty

absolute value of the quotient of the standard uncertainty and the associated measured value

NOTE The relative standard uncertainty is not defined if the measured value is zero.

relative expanded uncertainty
relative expanded measurement uncertainty

absolute value of the quotient of the expanded uncertainty and the associated measured value

NOTE The relative expanded uncertainty is not defined if the measured value is zero.

- **JCGM webinar on Measurement Uncertainty**
  WG1 and WG2 conveners presented the new definition of measurement uncertainty, given above, in a webinar — Have your say on the future definition of “measurement uncertainty” — held on 2 July 2025. About 900 attendees followed the event on various platforms. About 450 expressed their opinion on the new definition with two thirds of them in favour of it.

- **Artificial intelligence and measurement uncertainty**
  The JCGM-WG1 has a great interest in the evolution of Artificial Intelligence and its connection with measurement uncertainty. A workshop was held during the November 2025 meeting, with four talks by as many NMI experts, followed by a round-table discussion. The scope of the workshop was to help the JCGM-WG1 better understand in which way it could contribute to the topic. The need for a common language for AI terms and concepts that is recognized across the metrology and the broader AI community was recognized, as well as the relevance of a metrological approach for AI tools, able to assure quality control to the input and output data of those algorithms. Moreover, uncertainty modelling for examination and classification problems is undergoing and would be naturally related to corresponding AI and Machine Learning tools.

- **Metrology and Digitalisation**
  The JCGM-WG1 follows with interest the topic of Metrology and Digitalization. Several talks were given during past meetings on the topic, and a permanent liaison is established between JCGM-WG1 and the CIPM Forum-MD.

- **Metrology and meteorology.** The fruitful cooperation of JCGM-WG1 with the Expert Team on Measurement Uncertainty (ET-MU) of the World Meteorological Organisation (WMO) continues. Several members are actively involved with colleagues from their NMIs in a joint effort to put uncertainty evaluations in meteorology and climatology within the framework of the GUM.

PUBLICATIONS

Existing publications are listed below with their current titles. All the documents published prior to the new perspective will be revised and, if needed, updated in view of their publication as parts of the GUM suite.

JCGM 100:2008. Guide to the expression of uncertainty in measurement, GUM 1995, with minor modifications

Freely available in electronic (PDF) form from the websites of BIPM, OIML and ISO; published in paper form by ISO under the name "ISO/IEC Guide 98-3:2008".

JCGM 101:2008. Evaluation of measurement data — Supplement 1 to the "Guide to the expression of uncertainty in measurement" — Propagation of distributions using a Monte Carlo method

General method for measurement uncertainty evaluation, particularly relevant for measurement models with a high level of complexity, or to evaluate a coverage interval for a non-linear model or for non-normal input quantities. In these cases, the method, being more general than that described in JCGM 100, gives more reliable evaluations.

Freely available in electronic (PDF) form from the websites of BIPM, OIML and ISO; published in paper form by ISO under the name "ISO/IEC Guide 98-3:2008/Suppl 1:2008".

This document, suitably revised, will be re-published as GUM-7.

JCGM 102:2011. Evaluation of measurement data — Supplement 2 to the "Guide to the expression of uncertainty in measurement" — Extension to any number of output quantities

Generalization of JCGM 100 and JCGM 101 to the case of multivariate output quantities.

Freely available in electronic (PDF) form from the website of BIPM, OIML and ISO**;** published in paper form by ISO under the name "ISO/IEC Guide 98-3:2008/Suppl 2:2011".

This document, suitably revised, will be re-published as GUM-8.

JCGM 106:2012. Evaluation of measurement data — The role of measurement uncertainty in conformity assessment

Guidance document to calculate acceptance limits necessary to assess the conformity of an item to a specification.

Freely available in electronic (PDF) form from the websites of BIPM, OIML and ISO**;** published in paper form by ISO under the name "ISO/IEC Guide 98-4:2012".

This document was reviewed by the WG1 in view of its re-publication as GUM-4. It was decided that the document is technically sound and only requires modest updates in order to include recent developments in the field such as the extension to multivariate quantities. This task will be undertaken at a later stage.

JCGM GUM-6:2020. Guide to the expression of uncertainty in measurement — Part 6: Developing and using measurement models

This is the first document published as a part of the GUM under the new perspective. It provides guidance on developing and using a measurement model and covers the assessment of the adequacy of a measurement model. The document is of particular interest to developers of measurement procedures, working instructions and documentary standards.

Freely available in electronic (PDF) form from the websites of BIPM, OIML and ISO; published in paper form by ISO under the name "ISO/IEC Guide 98-6:2021".

JCGM GUM-1:2023 Guide to the expression of uncertainty in measurement – Part 1: Introduction

In the new perspective, GUM-1 is the overarching document in the suite of documents under the common title "Guide to the expression of uncertainty in measurement" (GUM), providing a brief introduction to the suite. Its aim is to promote appropriate methods for the evaluation of measurement uncertainty by using the GUM. This document aids the reader in identifying the relevant documents with their new numbering for addressing the problem at hand. It contains hyperlinks to documents in the suite. It also provides references to other relevant material, including that from other organizations, for a broader understanding. This document replaces JCGM 104:2009.

Freely available in electronic (PDF) form from the websites of BIPM, OIML and ISO; published in paper form by ISO under the name "ISO/IEC Guide 98-1:2024".

SUPERSEDED DOCUMENTS

JCGM 104:2009. Evaluation of measurement data — An introduction to the "Guide to the expression of uncertainty in measurement" and related documents

Introductory document extensively hyperlinked to the other JCGM documents.

This document was succeeded by GUM-1, described above.