

News from the JCGM-WG1

MEETINGS The JCGM-WG1 used to meet face-to-face twice per year, normally at the BIPM. Following the COVID-19 pandemic, one of the biannual meetings is held remotely. Other online meetings devoted to specific subjects are held when needed, typically with a reduced number of members. During 2023 the JCGM-WG1 met online in May and in November.

MEMBERSHIP Torgny Carlsson, Chair of ISO/TC 12, Quantities and units, joined JCGM-WG1 in June 2023, representing ISO.

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. A first document, JCGM GUM – Part 6: Developing and using measurement models, was published in 2020 (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-1:2023 Guide to the expression of uncertainty in measurement – Part 1: Introduction

In the new perspective, JCGM 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 will aid the reader in identifying the relevant documents with their new numbering for addressing the problem at hand. It will contain hyperlinks to documents in the suite. It also will provide references to other relevant material, including that from other organizations, for a broader understanding. This document will replace JCGM 104:2009.

The Final Draft of the document was circulated among the JCGM Member Organisations. It was approved by the MOs, with some minor editorial comments. Publication is expected in early 2024.

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 confirmed and approved 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 annex 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.

An advanced working draft was discussed during the November 2023 meeting. A first Committed Draft is expected to be ready for circulation among MOs and NMIs by spring 2024.

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.

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. The definitions that were so far decided are

measurement uncertainty
uncertainty of measurement

doubt about the true 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. It can be described summarily and approximately by a quantitative indication of the dispersion (or scatter) of such distribution.

NOTE 2 For scalar measurands, measurement uncertainty can be described summarily 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.

NOTE 3 When a quantitative expression is impractical, measurement uncertainty can be expressed using an ordinal scale of levels of confidence in the assigned value.

standard uncertainty

standard measurement uncertainty

measurement uncertainty expressed by a standard deviation

NOTE A standard measurement uncertainty can be, for example, the standard deviation of the probability distribution for the measurand, or the standard deviation of the mean of a set of measured values.

coverage interval

uncertainty expressed by an interval believed to contain, with stated probability, the true value of the measurand

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

coverage probability

probability associated with a coverage interval

- **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 presentations, joint and individual, were given at the [BIPM-WMO joint workshop on Metrology for Climate Action](#) in September 2022. Several abstracts involving WG1 members were also submitted to the workshop.

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 the [BIPM](#) and [OIML](#), and published in paper and PDF forms 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 the [BIPM](#) and [OIML](#), and published in paper and PDF forms by [ISO](#) under the name “ISO/IEC Guide 98-3:2008/Suppl 1:2008”.

This document, suitably revised, will be re-published as JCGM 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 the [BIPM](#) and [OIML](#), and published in paper and PDF forms by [ISO](#) under the name “ISO/IEC Guide 98-3:2008/Suppl 2:2011”.

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

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.

Freely available in electronic (PDF) form from the websites of the [BIPM](#) and [OIML](#), and published in paper and PDF forms by [ISO](#) under the name “ISO/IEC Guide 98-1:2009”.

This document will be succeeded by JCGM GUM-1, described above.

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 the [BIPM](#) and [OIML](#), and published in paper and PDF forms 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 JCGM GUM-4. It was decided that the document is technically sound and only needs some minor updates in order to include recent developments in the field. 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 the [BIPM](#) and [OIML](#) and published in paper and PDF forms by [ISO](#) under the name “ISO/IEC Guide 98-6:2021”