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GUIDE

GUIDE

Application of measurement uncertainty to conformity assessment activities in the electrotechnical sector

Application de l'incertitude de mesure aux activités d'évaluation de la conformité dans le secteur électrotechnique



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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APPLICATION OF MEASUREMENT UNCERTAINTY TO CONFORMITY ASSESSMENT ACTIVITIES IN THE ELECTROTECHNICAL SECTOR

FOREWORD

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This third edition of IEC Guide 115 has been prepared, in accordance with ISO/IEC Directives, Part 1, Annex A, by IECEE/CTL.

This third edition cancels and replaces the second edition published in 2021.

The main changes with respect to the previous edition are as follows:

a) document was rewritten to align with ISO/IEC 17025:2017;
b) content has been added to replace "accuracy method" with "simple acceptance" and added "decision rule";
c) modified document title to state "measurement uncertainty";
d) removed statement of document applicability to only IECEE CB Scheme;
e) removed list of IEC technical committees to indicate document can be used by other committees and industries;
f) added content for reporting statements of conformity.

The text of this Guide is based on the following documents:

Draft	Report on voting
SMBNC/30/DV	SMBNC/34/RV

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Guide is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

INTRODUCTION

This document has been prepared by the IECEE Committee of Testing Laboratories (CTL) to provide guidance on the practical application of the measurement uncertainty requirements of ISO/IEC 17025:2017 to the electrical safety testing conducted within the electrotechnical sector.

The aim of the CTL is, among other tasks, to define a common understanding of the test methodology with regard to the IEC standards as well as to ensure and continually improve the repeatability and reproducibility of test results among the member laboratories.

The practical approach to measurement uncertainty outlined in this document has been adopted for use in the IECEE Schemes, and is also extensively used around the world by testing laboratories engaged in testing electrical products to national safety standards.

ISO/IEC 17025 was written as a general use document, for all industries. Measurement uncertainty principles are applied to laboratory measurements and presentation of results to provide a degree of assurance that decisions made about conformance of the products tested, in accordance with the relevant requirements, are valid. Procedures and techniques for measurement uncertainty calculations are well established. This document is written to provide more specific guidance on the application of measurement uncertainty principles and applying the decision rule to conformance statements when reporting test results.

This document is of particular interest to IEC technical committees, which can decide to make use of it if necessary.

APPLICATION OF MEASUREMENT UNCERTAINTY TO CONFORMITY ASSESSMENT ACTIVITIES IN THE ELECTROTECHNICAL SECTOR

1 Scope

This document presents a practical approach to the application of measurement uncertainty to electrical safety testing conducted within the electrotechnical sector. It is specifically conceived for use in IECEE Schemes as well as by testing laboratories engaged in testing electrical products to national safety standards. It describes the application of measurement uncertainty principles.

This document provides guidance on making measurement uncertainty calculations and gives some examples relating to measurement uncertainty calculations for product conformity assessment testing.

NOTE The IEC Standardization Management Board (SMB) has decided that Guides such as this one can have mandatory requirements which shall be followed by all IEC committees developing technical work that falls within the scope of the Guide, as well as guidance which may or may not be followed. The mandatory requirements in this Guide are identified by the use of "shall". Statements that are only for guidance are identified by using the verb "should". (See ISO/IEC Directives, IEC Supplement:2021, A.1.1.)

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
measurand
quantity intended to be measured

[SOURCE: ISO/IEC Guide 99:2007, 2.3, modified – NOTES and EXAMPLES have been deleted.]

3.1.2
measurement uncertainty
non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used

[SOURCE: ISO/IEC Guide 99:2007, 2.26, modified – NOTES 1 to 4 have been deleted.]

3.1.3
decision rule
documented rule that describes how measurement uncertainty will be accounted for with regard to accepting or rejecting an item, given a specified requirement and the result of a measurement

[SOURCE: ISO/IEC Guide 98-4:2012, 3.3.12]

3.1.4
simple acceptance
decision rule in which the producer and user of the measurement result agree, implicitly or explicitly, to accept as conforming (and reject otherwise) an item whose property has a measured value in the tolerance interval

Note 1 to entry: The definition is based on ISO/IEC Guide 98-4:2012, 8.2.1.

Note 2 to entry: Within the IECEE CB Scheme, the producer is the laboratory and the user is the Certification Body.

3.1.5
coverage factor
number larger than one by which a combined standard measurement uncertainty is multiplied to obtain an expanded measurement uncertainty

Note 1 to entry: A coverage factor is usually symbolized k (see also ISO/IEC Guide 98-3:2008, 2.3.6).

[SOURCE: ISO/IEC Guide 99:2007, 2.38]

3.1.6
combined standard uncertainty
standard measurement uncertainty that is obtained using the individual standard measurement uncertainties associated with the input quantities in a measurement model

[SOURCE: ISO/IEC Guide 99:2007, 2.31, modified – The NOTE has been deleted.]

3.1.7
measurement error
measured quantity value minus a reference quantity value

[SOURCE: ISO/IEC Guide 99:2007, 2.16, modified – NOTES 1 and 2 have been deleted.)

3.1.8
expanded measurement uncertainty
product of a combined standard measurement uncertainty and a factor larger than the number one

Note 1 to entry: The factor depends upon the type of probability distribution of the output quantity in a measurement model and on the selected coverage probability.

Note 2 to entry: The term "factor" in this definition refers to a coverage factor.

[SOURCE: ISO/IEC Guide 99:2007, 2.35, modified – NOTE 3 has been deleted.]

3.1.9
level of confidence
probability that the value of the measurand lies within the quoted range of measurement uncertainty

3.1.10
standard deviation
positive square root of the variance

3.1.11
standard uncertainty
uncertainty of the result of a measurement expressed as a standard deviation

[SOURCE: ISO/IEC Guide 98-3:2008, 2.3.1]

3.1.12
Type A evaluation method
method of evaluation of measurement uncertainty by the statistical analysis of a series of observations

3.1.13
Type B evaluation method
method of evaluation of measurement uncertainty by means other than the statistical analysis of a series of observations (e.g. rectangular, triangular, distribution)

3.2 Symbols

X_i quantity input

x_i uncertainty contributor

4 Application of measurement uncertainty principles

4.1 General

4.1.1 Qualification and acceptance of CB test laboratories (CBTL) – for example, in the IECEE – is performed in accordance with ISO/IEC 17025.