INTERNATIONAL STANDARD

ISO 17123-1

Third edition
2014-08-15

Optics and optical instruments — Field procedures for testing geodetic and surveying instruments —

Part 1: Theory

Optique et instruments d'optique — Méthodes d'essai sur site pour les instruments géodésiques et d'observation —

Partie 1: Théorie

Reference number
ISO 17123-1:2014(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 6, *Geodetic and surveying instruments*.

This third edition cancels and replaces the second edition (ISO 17123-1:2010).

ISO 17123 consists of the following parts, under the general title *Optics and optical instruments — Field procedures for testing geodetic and surveying instruments*:

— *Part 1: Theory*

— *Part 2: Levels*

— *Part 3: Theodolites*

— *Part 4: Electro-optical distance meters (EDM measurements to reflectors)*

— *Part 5: Total stations*

— *Part 6: Rotating lasers*

— *Part 7: Optical plumbing instruments*

— *Part 8: GNSS field measurement systems in real-time kinematic (RTK)*

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Introduction

This part of ISO 17123 specifies field procedures for adoption when determining and evaluating the uncertainty of measurement results obtained by geodetic instruments and their ancillary equipment, when used in building and surveying measuring tasks. Primarily, these tests are intended to be field verifications of suitability of a particular instrument for the immediate task. They are not proposed as tests for acceptance or performance evaluations that are more comprehensive in nature.

The definition and concept of uncertainty as a quantitative attribute to the final result of measurement was developed mainly in the last two decades, even though error analysis has already long been a part of all measurement sciences. After several stages, the CIPM (Comité Internationale des Poids et Mesures) referred the task of developing a detailed guide to ISO. Under the responsibility of the ISO Technical Advisory Group on Metrology (TAG 4), and in conjunction with six worldwide metrology organizations, a guidance document on the expression of measurement uncertainty was compiled with the objective of providing rules for use within standardization, calibration, laboratory, accreditation and metrology services. ISO/IEC Guide 98-3 was first published as an International Standard (ISO document) in 1995.

With the introduction of uncertainty in measurement in ISO 17123 (all parts), it is intended to finally provide a uniform, quantitative expression of measurement uncertainty in geodetic metrology with the aim of meeting the requirements of customers.

ISO 17123 (all parts) provides not only a means of evaluating the precision (experimental standard deviation) of an instrument, but also a tool for defining an uncertainty budget, which allows for the summation of all uncertainty components, whether they are random or systematic, to a representative measure of accuracy, i.e. the combined standard uncertainty.

ISO 17123 (all parts) therefore provides, for defining for each instrument investigated by the procedures, a proposal for additional, typical influence quantities, which can be expected during practical use. The customer can estimate, for a specific application, the relevant standard uncertainty components in order to derive and state the uncertainty of the measuring result.

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Optics and optical instruments — Field procedures for testing geodetic and surveying instruments —

Part 1: Theory

1 Scope

This part of ISO 17123 gives guidance to provide general rules for evaluating and expressing uncertainty in measurement for use in the specifications of the test procedures of ISO 17123-2, ISO 17123-3, ISO 17123-4, ISO 17123-5, ISO 17123-6, ISO 17123-7 and ISO 17123-8.

ISO 17123-2, ISO 17123-3, ISO 17123-4, ISO 17123-5, ISO 17123-6, ISO 17123-7 and ISO 17123-8 specify only field test procedures for geodetic instruments without ensuring traceability in accordance with ISO/IEC Guide 99. For the purpose of ensuring traceability, it is intended that the instrument be calibrated in the testing laboratory in advance.

This part of ISO 17123 is a simplified version based on ISO/IEC Guide 98-3 and deals with the problems related to the specific field of geodetic test measurements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC Guide 99 and the following apply.

3.1 General metrological terms

3.1.1
(measurable) quantity
property of a phenomenon, body or substance, where the property has a magnitude that can be expressed as a number and a reference

EXAMPLE 1 Quantities in a general sense: length, time, temperature.

EXAMPLE 2 Quantities in a particular sense: length of a rod.

3.1.2
value
value of a quantity
quantity value
number and reference together expressing the magnitude of a quantity

EXAMPLE Length of a rod: 3,24 m.

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