

## **Air quality - Guidelines for estimating measurement uncertainty**

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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 20988:2007 sisaldab Euroopa standardi EN ISO 20988:2007 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 27.07.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 20988:2007 consists of the English text of the European standard EN ISO 20988:2007.</p> <p>This document is endorsed on 27.07.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b></p> <p>This International Standard provides comprehensive guidance and specific statistical procedures for uncertainty estimation in air quality measurements including measurements of ambient air, stationary source emissions, indoor air, workplace atmospheres and meteorology. It applies the general recommendations of the Guide to the Expression of Uncertainty in Measurement (GUM) to boundary conditions met in air quality measurement. The boundary conditions considered include measurands varying rapidly in time, as well as the presence of bias in a series of observations obtained under conditions of intended use of methods of air quality measurement.</p>	<p><b>Scope:</b></p> <p>This International Standard provides comprehensive guidance and specific statistical procedures for uncertainty estimation in air quality measurements including measurements of ambient air, stationary source emissions, indoor air, workplace atmospheres and meteorology. It applies the general recommendations of the Guide to the Expression of Uncertainty in Measurement (GUM) to boundary conditions met in air quality measurement. The boundary conditions considered include measurands varying rapidly in time, as well as the presence of bias in a series of observations obtained under conditions of intended use of methods of air quality measurement.</p>
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English Version

## Air quality - Guidelines for estimating measurement uncertainty (ISO 20988:2007)

Qualité de l'air - Lignes directrices pour estimer l'incertitude  
de mesure (ISO 20988:2007)

Luftbeschaffenheit - Leitlinien zur Schätzung der  
Messunsicherheit (ISO 20988:2007)

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## Foreword

This document (EN ISO 20988:2007) has been prepared by Technical Committee ISO/TC 146 "Air quality" in collaboration with Technical Committee CEN/TC 264 "Air quality", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2007, and conflicting national standards shall be withdrawn at the latest by December 2007.

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## Endorsement notice

The text of ISO 20988:2007 has been approved by CEN as EN ISO 20988:2007 without any modifications.

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measurement uncertainty**

*Qualité de l'air — Lignes directrices pour estimer l'incertitude de mesure*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 20988 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 4, *General aspects*.



## Introduction

The general concept of uncertainty estimation is described in the *Guide to the Expression of Uncertainty in Measurement* (GUM). Practical considerations of the GUM are focussed on evaluation of series of unbiased observations. In air quality measurements, series of observations may rarely be considered unbiased due to the presence of random effects not varying throughout a series of observations.

This International Standard supports evaluation of random effects causing variation or bias in series of observations for the purpose of uncertainty estimation. Appropriate data may be collected in experimental designs providing comparison with reference material, or with reference instruments, or with independent measurements of the same type. In provision of experimental data for uncertainty estimation, it is important to ensure representativeness for variations and bias occurring in intended use of the method of measurement.

Generic guidance and statistical procedures presented by this International Standard are addressed to technical experts of air quality measurement, acting, e.g. in standardization, validation or documentation of methods of measurement in ambient air, indoor air, stationary source emissions, workplace atmospheres or meteorology.

This International Standard does not provide comprehensive information on planning and execution of experimental designs to be evaluated for the purpose of uncertainty estimation.

Uncertainties of results of measurement caused by incomplete time-coverage of measurement data are not considered in this document, but in ISO 11222<sup>[2]</sup>. Uncertainties of results of measurement induced by incomplete spatial coverage by measurement data are not considered in this document.

# Air quality — Guidelines for estimating measurement uncertainty

## 1 Scope

This International Standard provides comprehensive guidance and specific statistical procedures for uncertainty estimation in air quality measurements including measurements of ambient air, stationary source emissions, indoor air, workplace atmospheres and meteorology. It applies the general recommendations of the *Guide to the Expression of Uncertainty in Measurement* (GUM) to boundary conditions met in air quality measurement. The boundary conditions considered include measurands varying rapidly in time, as well as the presence of bias in a series of observations obtained under conditions of intended use of methods of air quality measurement.

The methods of measurement considered comprise

- methods corrected for systematic effects by repeated observation of reference materials,
- methods calibrated by paired measurement with a reference method,
- methods not corrected for systematic effects because they are unbiased by design, and
- methods not corrected for systematic effects in intended use deliberately taking into account a bias.

Experimental data for uncertainty estimation can be provided either by a single experimental design in a direct approach or by a combination of different experimental designs in an indirect approach.

## 2 Normative references

The following referenced documents are indispensable for the application 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 Guide 98:1995, *Guide to the expression of uncertainty in measurement* (GUM)

## 3 Terms and definitions

### 3.1

#### **uncertainty (of measurement)** **measurement uncertainty**

parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

[ISO/IEC Guide 98:1995, B.2.18; VIM:1993, 3.9]

### 3.2

#### **standard uncertainty**

uncertainty of the result of measurement expressed as a standard deviation

[ISO/IEC Guide 98:1995, 2.3.1]