SLOVENSKI STANDARD
SIST ISO 6879:1997

01-avgust-1997

Kakovost zraka - Delovne karakteristike in z njimi povezani koncepti za metode merjenja kakovosti zraka

Air quality - Performance characteristics and related concepts for air quality measuring methods

Qualité de l'air - Caractéristiques de fonctionnement et concepts connexes pour les méthodes de mesurage de la qualité de l'air

Ta slovenski standard je istoveten z: **ISO 6879:1995**

ICS:

13.040.01 Kakovost zraka na splošno Air quality in general

SIST ISO 6879:1997 **en**

INTERNATIONAL STANDARD

ISO 6879

Second edition
1995-12-15

Air quality — Performance characteristics and related concepts for air quality measuring methods

Qualité de l'air — Caractéristiques de fonctionnement et concepts connexes pour les méthodes de mesurage de la qualité de l'air

Reference number
ISO 6879:1995(E)

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.

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.

International Standard ISO 6879 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 4, *General aspects*.

This second edition cancels and replaces the first edition (ISO 6879:1983), which has been technically revised.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

This International Standard which comprises definitions of terms and performance characteristics used in assessing air quality should be used in conjunction with the specific standard test methods prepared by ISO/TC 146, *Air quality*.

This page intentionally left blank

Air quality — Performance characteristics and related concepts for air quality measuring methods

1 Scope

This International Standard defines terms and performance characteristics related to air quality measuring methods. The values of the performance characteristics, determined in accordance with an associated series of test methods, are intended to be used to confirm whether a method is appropriate when assessing air quality in any given situation. This International Standard does not include specific methods for determining air quality or obtaining representative samples or for selecting the number of measurements necessary for a given task, these being covered in other International Standards.

The performance characteristics listed also apply to respective emission measurement procedures.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO Guide 30:1992, *Terms and definitions used in connection with reference materials.*

ISO 3534-1:1993, *Statistics — Vocabulary and symbols — Part 1: Probability and general statistical terms.*

3 Symbols and abbreviations

C	Air quality characteristic
c	Value of C
$\hat{c}$	Measured value of C
C_i	ith interferent, with i = 1, 2, ..., n
c_i	Value of C_i
c_0	Zero sample value of the air quality characteristic C
c_D	Detection limit
c_Q	Quantification limit
f	Analytical function
g	Calibration function
I	First order measure of the value of selectivity related to the ith interferent
n	Total number of interferents considered
r	Repeatability limit
R	Reproducibility limit
S	Sensitivity
X	Output variable
x	Value of X
$\bar{x}_0$	Mean output signal of a zero sample
x_D	Decision limit
α, β	Significance levels[1] (see ISO 3534-1)

1) 5 % by convention.

4 Rationale

The definitions comprise basic concepts and the three types of performance characteristics (statistical, functional and operational).

In order to define the performance characteristics, it is necessary to describe the three terms basic to the measuring process, i.e. value of air quality characteristic[2], output signal (5.1.10) and measured value (5.1.7).

The value of air quality characteristic c is the true value of the air quality characteristic being investigated. The output signal x is the value of the output variable of a measuring system obtained as a response related to the concentration or value of the air quality characteristic contained in the air sample being considered. The output variable may be an output voltage, a turning angle of an indicator, a scale reading, quantity of standard volumetric solution used for titration, etc. The measured value $\hat{c}$ is the estimated value of the air quality characteristic, derived from output signals, and generally involves calculations related to the calibration process and conversion to required quantities.

The calibration function (5.2.4) is the relation between output variables and quantifiable properties (concentration, particle size, etc.) of reference materials used during the calibration process. The analytical function (5.2.2) is the relation between the measured values and the output variables and is estimated from regression analysis of air quality characteristic values versus output variables. These relations are not deterministic but stochastic, usually unstable (see 5.2.9) and biased (see 5.2.3).

Statistical performance characteristics quantify, for measured values, the possible deviations resulting from the random part of the measuring process; these are, for example, repeatability or instability.

Functional performance characteristics are estimates of the deterministic part of the measuring process, for example, sensitivity, calibration function or response time.

Operational performance characteristics deal with the influence of the physical and chemical environment and maintenance problems, for example, input voltage, temperature, supply of certain substances, set-up time, warm-up time or period of unattended operation.

The statistical and functional performance characteristics given should be sufficient in most cases. For practical reasons, the list of operational performance characteristics is limited. In special cases, the user is asked to adopt performance characteristics not listed in 5.2, but which are suitable for the special method or instrument under consideration.

5 Basic concepts and performance characteristics

5.1 Basic concepts

5.1.1 air quality characteristic: One of the quantifiable properties relating to an air mass under investigation, for example, concentration of a constituent.

5.1.2 air sample: Amount of air which is assumed to be representative of the air mass under investigation, and which is examined for air quality characteristics.

5.1.3 blank reading: Output signal for a zero sample.

5.1.4 failure of the system: Termination of the ability of a measuring system to perform its required function.

NOTE 1 Any system is a collection of instruments and components that are electrically and mechanically joined to perform a specific function. System failures can therefore be defined as having occurred when the operating characteristics of a component, or a group of components, change to the extent that the system can no longer satisfactorily perform its expected function.

5.1.5 interferent: Component of the air sample, excluding the measured constituent, that effects the output signal.

5.1.6 measured constituent: Component of the air sample for which a quantity is to be determined by measurement.

5.1.7 measured value: Estimated value of the air quality characteristic derived from an output signal; this usually involves calculations related to the calibration process and conversion to required quantities.

5.1.8 memory effect: Temporary dependence of an output signal on one or several previous values of the air quality characteristics.

2) Defined as measurand in [1] in annex A.

5.1.9 method: Procedure for sampling and determining one or more air quality characteristics, the accuracy of which is established using either a reference material or reference procedures.

NOTE 2 Two or more methods are considered equivalent if the values for their statistical and functional performance characteristics, for example bias, precision or sensitivity, fall within minimum specified limits and tolerances in the presence of specified interferent(s) and under specified operating conditions.

5.1.10 output signal: Value of output variable of a measuring system obtained as a response related to the value of the air quality characteristic.

5.1.11 reference material (RM): Material or substance one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. [ISO Guide 30]

5.1.11.1 reference material (RM): ⟨air quality measuring methods⟩ Substance or mixture of substances, the composition of which is known within specified limits, and one or more of the properties of which are sufficiently well established over a stated period of time to be used for the calibration of an apparatus, the assessment of a measuring method, or for assigning values to materials.

5.1.12 reference procedure: Agreed set of theoretical and practical operations for determining one or more air quality characteristics where it is not practical to produce a reference material; the result obtained is defined as the measure of the air quality characteristic.

5.1.13 zero sample: Substance or mixture of substances resembling, as closely as possible, the matrix of the actual air sample to be measured, but characterized by a value of the air quality characteristic which is not detectable by the method used.

NOTE 3 In practice, the value of the air quality characteristic is considered to be zero.

5.2 Performance characteristics

5.2.1 accuracy: The closeness of agreement between a test result and the accepted reference value. [ISO 3534-1]

5.2.1.1 accuracy: ⟨air quality measuring methods⟩ Closeness of agreement between a single measured value and the value of the air quality characteristic itself, or the accepted reference value.

5.2.2 analytical function: Inverse of the calibration function.

5.2.3 bias: The difference between the expectation of the test results and an accepted reference value. [ISO 3534-1]

5.2.3.1 bias: ⟨air quality measuring methods⟩ Consistent deviation of the measured value from the value of the air quality characteristic itself, or the accepted reference value.

NOTE 4 Bias is often called "systematic error".

5.2.4 calibration function: Output variable X as a function of the air quality characteristic C under investigation represented by reference materials, with all interferents C_i remaining constant:

$$X = g(C, C_1, ..., C_n)|_{C_i = \text{constant},\ i = 1 \ldots n} \quad \ldots (1)$$

If the sensitivity (see 5.2.21) is a constant, the calibration function will be linear and

$$X = S \cdot C + \text{constant}$$

NOTE 5 The calibration function may be estimated by regression analysis.

5.2.5 cut off (for particular matter): Size of particles at which the retention efficiency of an instrument device drops below a specified value under defined conditions.

5.2.6 decision limit: Output signal value above which it can be affirmed, with a probability 1-α of at least 95 %[3], that the measured sample is different from a zero sample (see figure 1).

NOTE 6 A zero sample has 5 %[3] probability of causing an output signal above the decision limit.

5.2.7 detection limit: Value of the air quality characteristic allocated to the decision limit using the calibration function (see figure 1).

NOTES

7 Formerly defined as "lower detection limit".

8 When, in a sample, the value of the air quality characteristic is at the detection limit, 50 % of the measured output signal values will exceed the decision limit, provided that the distribution is symmetrical.

3) By convention.