Designation: D 5280 – 96 (Reapproved 2001)

Standard Practice for Evaluation of Performance Characteristics of Air Quality Measurement Methods with Linear Calibration Functions[1]

This standard is issued under the fixed designation D 5280; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice[2] covers procedures for evaluating the following performance characteristics of air quality measurement methods: bias (in part only), calibration function and linearity, instability, lower detection limit, period of unattended operation, selectivity, sensitivity, and upper limit of measurement.

1.2 The procedures presented in this practice are applicable only to air quality measurement methods with linear continuous calibration functions, and the output variable of which is a defined time average. The linearity may be due to postprocessing of the primary output variable. Additionally, replicate values belonging to the same input state are assumed to be normally distributed. Components required to transform the primary measurement method output into the time averages desired are regarded as an integral part of this measurement method.

1.3 For surveillance of measurement method stability under routine measurement conditions, it may suffice to check the essential performance characteristics using simplified tests, the degree of simplification acceptable being dependent on the knowledge on the invariance properties of the performance characteristics previously gained by the procedures presented here.

1.4 There is no fundamental difference between the instrumental (automatic) and the manual (for example, wet-chemical) procedures, as long as the measured value is an average representative for a predefined time interval. Therefore, the procedures presented are applicable to both. Furthermore, they are applicable to measurement methods for ambient, workplace, and indoor atmospheres, as well as emissions.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres[3]

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods[4]

E 456 Terminology Relating to Quality and Statistics[4]

2.2 *ISO Standard:*

ISO 6879: 1983, Air Quality—Performance Characteristics and Related Concepts for Air Quality Measuring Methods[5]

3. Terminology

3.1 *Definitions*:

3.1.1 For definitions of terms used in this practice, refer to Terminology D 1356.

3.2 *Definitions of Terms Specific to This Standard*:

NOTE 1—The statistical performance characteristics used throughout this practice are estimated, by convention, at the confidence level $1 - \alpha = 0.95$.

3.2.1 *averaging time*— predefined time interval length for which the air quality characteristic is made representative and $\Delta\theta$ the averaging time.

3.2.1.1 *Discussion*—Every measured value obtained is representative for a defined interval of time, τ, the value of which always lies above a certain minimum due to the intrinsic properties of the measuring procedure applied. In order to attain mutual comparability of data pertaining to comparable objects, a normalization to a common, predefined interval of time is necessary.

3.2.1.2 *Discussion*—By convention, this normalization is achieved by transformation by means of a simple, linear, and unweighted averaging process.

(a) Series of Discrete Samples:

[1] This practice is under the jurisdiction of ASTM Committee D22 on Sampling and Analysis of Atmospheres and is the direct responsibility of Subcommittee D22.03 on Ambient Atmospheres and Source Emissions.

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[2] This practice was adapted from International Standard ISO/DP 9169, prepared by ISO/TC 146/SC 4/WG 4, by the kind permission of the Chairman of ISO/TC 146 and the Secretariat of ISO/TC 146/SC 4.

[3] *Annual Book of ASTM Standards*, Vol 11.03.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Available from International Organization for Standardization, Case Pastale 56, CH-1211, Geneva 20, Switzerland.

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