



Standard Guide for Intercomparing Permeation Tubes to Establish Traceability¹

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1. Scope

1.1 This guide covers two procedures for establishing the permeation rate of a permeation tube and defining the uncertainty of the rate by comparison to National Institute of Standards and Technology's Standard Reference Materials (SRM).

1.2 Procedure A consists of a direct comparison of the permeation rate of the device undergoing calibration with that of an SRM.

1.3 Procedure B consists of a gravimetric calibration process in which a certified permeation tube is used as a quality control for the measurements.

1.4 Both procedures are limited to the case where a suitable certified permeation device is available.

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. (See 8.2 on Safety Precautions.)*

2. Referenced Documents

2.1 ASTM Standards:

D 1356 Terminology Relating to Sampling and Analysis of Atmospheres²

D 3249 Practice for General Ambient Air Analyzer Procedures²

D 3609 Practice for Calibration Techniques Using Permeation Tubes²

D 3631 Test Methods for Measuring Surface Atmospheric Pressure²

E 1 Specification for ASTM Thermometers³

E 319 Practice for the Evaluation of Single-Pan Mechanical Balances⁴

E 617 Specification for Laboratory Weights and Precision Mass Standards⁴

3. Terminology

3.1 Definitions:

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

3.1.2 Definitions of Terms Specific to This Standard:

3.1.2.1 *working standard*—a standard used in the laboratory or field for periodic standardization of a measuring instrument.

4. Summary of Guide

4.1 *Procedure A*—A certified SRM permeation source, obtained from the National Institute of Standards and Technology is used to calibrate a continuous analyzer. The analyzer is then used to measure the concentration of a gaseous mixture generated from the permeation tube under calibration. Equations are provided that permit calibration of the permeation rate of the latter from the test data.

4.2 *Procedure B*—The permeation source is calibrated, gravimetrically, using temperature and mass standards traceable to NIST standards. The validity of the calibration is confirmed by concurrently measuring the permeation rate of a certified NIST SRM.

5. Significance and Use

5.1 The accuracy of air pollution measurements is directly dependent upon accurate calibrations.

5.2 Such measurements gain accuracy and can be intercompared when the measurement procedures are traceable to national measurement standards.

5.3 This guide describes procedures for enhancing the accuracy of air pollution measurements which may be specified by those organizations requiring traceability to national standards.

6. Apparatus

6.1 For apparatus used in the calibration of permeation devices, refer to Practice D 3609.

6.1.1 The thermometers used shall conform to Specification E 1 and shall have calibration certificates traceable to the NIST. Measurement uncertainty should be 0.1°C or less.

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² *Annual Book of ASTM Standards*, Vol 11.03.

³ *Annual Book of ASTM Standards*, Vol 14.03.

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