



Designation: D8470 – 22

Standard Practice for Development and Implementation of Instrument Performance Tests for Use on Multivariate Online, At-Line and Laboratory Spectroscopic Based Analyzer Systems¹

This standard is issued under the fixed designation D8470; 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 covers basic procedures that can be used to develop instrument performance tests for spectroscopic based online, at-line, laboratory and field analyzers. The practice is intended to be applicable to Raman spectrometers and to infrared spectrophotometers operating in the near-infrared and mid-infrared regions.

1.2 This practice is not intended as a replacement for specific practices, such as Practices [E275](#), [E925](#), [E932](#), [E958](#), [E1421](#), or [E1683](#) that exist for measuring performance of specific types of laboratory spectroscopic instruments. Instead, this practice is intended to provide guidelines as to how similar practices should be developed when specific practices do not exist for a particular instrument type, or when specific practices are not applicable due to sampling or safety concerns. This practice can be used to develop instrument performance tests for on-line process spectroscopic-based analyzers.

1.2.1 The performance tests described in this practice typically only evaluate the performance of the infrared spectrophotometer or Raman spectrometer part of the analyzer system, referred to herein as the instrument.

1.2.2 Instrument performance tests do not typically evaluate performance of analyzer sampling systems.

1.3 This practice describes univariate level zero and level one tests, and multivariate level A and level B tests which can be implemented to measure instrument performance. These tests are designed to be used as rapid, routine checks of instrument performance. They are designed to uncover malfunctions or other changes in instrument operation, but do not specifically diagnose or quantitatively assess the malfunction or change. The tests are not intended for the comparison of instruments or analyzers of different manufacture.

1.4 The instrument performance tests described in this practice are used during the development of multivariate

calibrations via Practice [D8321](#) to establish the performance level at the time the calibration is developed. The same tests are used during validation of analyzers via Practice [D6122](#) to qualify the working analyzer by demonstrating comparable performance.

1.4.1 Instrument performance tests are used to requalify instruments after analyzer maintenance.

1.4.2 Instrument performance tests are used to qualify instruments in secondary analyzers to which calibrations are being transferred after development on a primary analyzer.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D4175](#) Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

[D6122](#) Practice for Validation of the Performance of Multivariate Online, At-Line, Field and Laboratory Infrared Spectrophotometer, and Raman Spectrometer Based Analyzer Systems

[D7940](#) Practice for Analysis of Liquefied Natural Gas (LNG) by Fiber-Coupled Raman Spectroscopy

[D8321](#) Practice for Development and Validation of Multivariate Analyses for Use in Predicting Properties of Petroleum Products, Liquid Fuels, and Lubricants based on Spectroscopic Measurements

¹ This practice is under the jurisdiction of ASTM Committee [D02](#) on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee [D02.25](#) on Performance Assessment and Validation of Process Stream Analyzer Systems.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.