



Standard Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance¹

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^{ε1} NOTE—Editorially corrected 3.3.8 in November 2022.

1. Scope*

1.1 This practice covers information for the design and operation of a program to monitor and control ongoing stability and precision and bias performance of selected analytical measurement systems using a collection of generally accepted statistical quality control (SQC) procedures and tools.

NOTE 1—A complete list of criteria for selecting measurement systems to which this practice should be applied and for determining the frequency at which it should be applied is beyond the scope of this practice. However, some factors to be considered include (1) frequency of use of the analytical measurement system, (2) criticality of the parameter being measured, (3) system stability and precision performance based on historical data, (4) business economics, and (5) regulatory, contractual, or test method requirements.

1.2 This practice is applicable to stable analytical measurement systems that produce results on a continuous numerical scale.

1.3 This practice is applicable to laboratory test methods.

1.4 This practice is applicable to validated process stream analyzers.

1.5 This practice is applicable to monitoring the differences between two analytical measurement systems that purport to measure the same property provided that both systems have been assessed in accordance with the statistical methodology in Practice D6708 and the appropriate bias applied.

NOTE 2—For validation of univariate process stream analyzers, see also Practice D3764.

NOTE 3—One or both of the analytical systems in 1.5 may be laboratory test methods or validated process stream analyzers.

1.6 This practice assumes that the normal (Gaussian) model is adequate for the description and prediction of measurement system behavior when it is in a state of statistical control.

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 D02.94 on Coordinating Subcommittee on Quality Assurance and Statistics.

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NOTE 4—For non-Gaussian processes, transformations of test results may permit proper application of these tools. Consult a statistician for further guidance and information.

1.7 *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

- D3764 Practice for Validation of the Performance of Process Stream Analyzer Systems
- D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants
- D5191 Test Method for Vapor Pressure of Petroleum Products and Liquid Fuels (Mini Method)
- D6300 Practice for Determination of Precision and Bias Data for Use in Test Methods for Petroleum Products, Liquid Fuels, and Lubricants
- D6617 Practice for Laboratory Bias Detection Using Single Test Result from Standard Material
- D6708 Practice for Statistical Assessment and Improvement of Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material
- D6792 Practice for Quality Management Systems in Petroleum Products, Liquid Fuels, and Lubricants Testing Laboratories
- D7372 Guide for Analysis and Interpretation of Proficiency Test Program Results
- D7915 Practice for Application of Generalized Extreme Studentized Deviate (GESD) Technique to Simultaneously Identify Multiple Outliers in a Data Set
- E177 Practice for Use of the Terms Precision and Bias in

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.

*A Summary of Changes section appears at the end of this standard