MVS® Traceability Document

1.1 Introduction

The MVS consists of a set of components that are used to measure liquid volumes dispensed into 96- and 384-well microtiter plates. The various MVS components not only allow for measurement of the accuracy and precision of liquid volumes dispensed by a liquid handling device, but also provide for traceability of these measurements to the International System of Units (SI). This path of traceability allows for standard-ization of calibration results between various liquid handlers within a facility, as well as between laborato-ries in different locations. This ensures that all liquid handling equipment is calibrated against one common traceable standard.

1.2 Traceability

Standardization of MVS results occurs through an unbroken chain of comparisons that lead back to the International System of Units (SI) via Artel reference standards and National Measurement Institutions with each comparison having a stated uncertainty. Artel's competence to perform these comparisons has been assessed by the American Association for Laboratory Accreditation (A2LA), and this accreditation is recognized internationally under the ILAC MRA (International Laboratory Accreditation Cooperation Mutual Recognition Agreement). Artel's A2LA certificate numbers are 2093-01 and 2093-03.

The path of traceability for MVS occurs through three main measurement paths: 1) MVS Verification Plates, 2) the MVS Plate Reader and 3) MVS Sample Solutions. Every volume tested with the MVS produces a final result that is calculated based upon all three traceable paths.

The paths of traceability are best described by following through the steps of a typical MVS volume test:

1.2.1 Step I: MVS Verification Plates

For test volumes dispensed into the wells of an MVS Verification Plate, traceability is established through well-by-well characterization for deviations from ideal geometry by: 1) proportional dilutions made on 5-place and 6-place balances 2) well-to-well characterization, and 3) proprietary methods.

When a lot of plates is manufactured, a statistical sampling plan is used to pull plates throughout the manufacturing run. Proportional dilutions are made on balances calibrated with OIML RIII Class E2 weights, which are in turn traceable to mass standards maintained by the NIST. The dilutions are used to determine deviations from ideal performance within the operating absorbance range of the MVS using the sampling of plates. The statistical sampling plan provides measurements representative of each well in that particular plate lot.

1.2.2 Step II: Plate Reader

The MVS Calibrator Plate provides the second traceable step for any MVS analysis. The solution filled cuvettes in the plate provide optical standards which are used to correlate the daily performance of the MVS Plate Reader to the performance of the reference spectrophotometer in the Artel laboratory. In this way, all photometric measurements performed in the field by any MVS Plate Reader are traceable back to National and International standards through the reference spectrophotometer, which is regularly compared to neutral density glass standards with traceable optical densities through the NPL.

1.2.3 Step III: MVS Sample Solutions

MVS Sample Solutions provide the final traceable step in MVS analyses. The absorbance per unit path length of all solutions is measured in the Artel reference spectrophotometer, with established traceability described in section 1.2.2. The absorbance per unit pathlength values are determined on a lot-to-lot basis and are encoded on a barcode attached to each solution. The values are entered into the system software using the barcode scanner and are used in the appropriate volume calculations for each plate type.

1.3 Summary

The components of the Artel Multichannel Verification System work together to provide performance metrics about the liquid delivery capabilities of various types of multichannel dispensers. The accuracy and precision results generated by MVS are traceable to the International System of Units (SI), including standards maintained by NIST-USA and the NPL-UK. This traceability allows standardization between various equipment types and various laboratories within a user facility.

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