Firearms and Toolmarks 3D Measurement Systems and Measurement Quality Control

WHAT IS AN AAFS STANDARD FACTSHEET?

The AAFS produces clear, concise, and easy-to-understand factsheets to summarize the contents of technical and professional forensic science standards on the OSAC Registry. They are not intended to provide an interpretation for any portion of a published standard.

WHAT IS THE PURPOSE OF THIS STANDARD?

This standard provides guidelines for measurement systems which capture data beyond a flat 2D photographic image for Firearm and Toolmark Analysis; in this document these systems are referred to as 3D systems.

The requirements are intended to ensure the instrument's accuracy, to conduct instrument calibration, and to estimate measurement uncertainty for each axis (X, Y, and Z). Included in the standard are procedures for validation of 3D system hardware. The focus of this standard is on the hardware and resulting measurement data. This standard does not include the guidelines for measurement systems software (ANSI/ASB 062, 1st Ed., 2021) or implementation (ANSI/ASB 063, 1st Ed., 2021).

WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

The document establishes performance expectations for new 3D measurement technologies while allowing legacy systems to coexist in the lab. Adherence to the standard promotes the production of reliable data and statistically-based conclusions.

The standard is applicable to all forensic science service providers that provide conclusions regarding toolmark-related evidence using 3D measurement systems.

HOW IS THE STANDARD USED, AND WHAT ARE THE KEY ELEMENTS?

The standard describes processes to establish the accurate and reliable data collection of 3D surface topographies (*i.e.*, physical features). The document details the development and the deployment validations that should be completed prior to the use of a new 3D technology in casework examinations. It describes *who* should perform these validations and *how* they should be structured. It includes information on determining the instrument's repeatability, reproducibility, and measurement uncertainty.

The standard also includes guidance on ongoing performance checks. These checks demonstrate that the measurements are traceable, and that the instrument did not drift during the measurements. These activities should be documented in control charts. The standard also describes how to handle quality control failures.

Finally, the standard specifies the use of the common X3P file format (ISO 25178-72) for the exchange of 3D topography data. Use of this standard file format ensures that any compliant 3D scanning system can exchange 3D measurement data. If these systems have established traceability and have also completed the specified development validation, deployment validation, and ongoing performance checks then the systems can safely exchange measurement data.

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