

## Standard for Topography Comparison Software for Toolmark Analysis



### 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?

Topography analysis and comparison software provides a means of evaluating the similarities and differences between high resolution surface measurements of toolmarks. The aim of such analysis is a quantifiable measure of toolmark topography comparisons to assist an examiner in reaching a conclusion or an assessment of the weight of the evidence regarding common origin.

This standard specifies the minimum requirements for computer software intended to compare 2D and/or 3D digital representations of toolmarks. It covers necessary conditions for consistent and interpretable comparisons. The standard is intended to be used alongside the related 3D measurement hardware standard ([ANSI/ASB 061, 1<sup>st</sup> Ed., 2021](#)) and the implementation standard ([ANSI/ASB 063, 1<sup>st</sup> Ed., 2021](#)).

### WHY IS THIS STANDARD IMPORTANT? WHAT ARE ITS BENEFITS?

This standard establishes validation requirements for the use of comparison software in toolmark comparisons. Adherence to the requirements promotes comparison scores generated by a system being used in an appropriate manner. The standard establishes reporting and testimony requirements for three different categories of scores. This helps avoid overstating the significance of the comparison score.

The standard is applicable to all forensic science service providers that issue conclusions regarding toolmark-related evidence (e.g., Firearms).

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

The standard describes processes to establish the accurate and reliable data analysis of 2D and/or 3D surface topographies. The standard defines 1D, 2D, and 3D topography data, and then describes how this data can be analyzed in three categories (levels) of software. Category 0 focuses on hit finding and specimen sorting. Category 1 requires the use of an Interpretable Scoring Function. Category 2 software requires the use of an Interpretable Scoring Function and is supported by a validated statistical measure.

This standard details the criteria for achieving each category and the allowed uses of software at each level. This process promotes the appropriate use of toolmark comparison software that is supported by relevant validation studies. Details are provided for the development and the deployment validations that shall be completed prior to the use of new 3D technology in casework examinations. It describes who should perform validations and how they should be structured. In conjunction with the related implementation document ([ANSI/ASB 063, 1<sup>st</sup> Ed., 2021](#)), this standard requires that these activities shall be documented.

Requirements on the topics of user training, statistical models, and criteria for Interpretation are also included.

