

	<b>FAPM 8.0 Physical Examination &amp; Classification of Toolmarks</b>	
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	Document Manager: Andrew Carriveau	Approved By: Jeffrey Nye

## 8.0 Physical Examination & Classification of Toolmarks

### 8.1 Introduction

The basic objective in evaluating a questioned toolmark is to determine tool class and suitability for comparison. In order to compare a questioned toolmark with a suspect tool, test marks are made with the suspect tool. The basic objective in preparing test standards is to attempt to duplicate the manner in which the tool was used to reproduce the microscopic features present in the questioned toolmark.

### 8.2 Safety Consideration

Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the Laboratory Operations Manual and the Health and Safety Manual.

### 8.3 Preparation of Cleaning Solutions

#### 8.3.1 Bleach Solution

- Prepare a Bleach Solution as needed by combining 10 milliliters of bleach to 90 milliliters of distilled water
- Discard after use

### 8.4 Instrumentation

- Stereo Microscope
- Comparison Microscope
- Caliper
- Micrometer
- Ruler or tape measure
- The unique identifier assigned or serial number of the instrumentation used shall be listed in log book for Examiners' Equipment Used

### 8.5 Minimum Analytical Standards and Controls

[Appendix A](#)

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## 8.6 Procedure or Analysis

The evidence and tests produced will be marked in accordance with the [Laboratory Operations Manual Section 4.3](#).

### 8.6.1 General, Physical, and Trace Examinations

The initial examination of a tool or a toolmark will include the completion of a worksheet, which will include the physical description of the tool and/or toolmark. It will also serve as a source to document the condition of the evidence as received. Further information will be added to the worksheet as tests and comparisons are performed.

### 8.6.2 Trace Material Examination

Evidence recovered during an investigation may contain trace material transferred from the crime scene. This material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. Removal and/or preservation of this material may be necessary to allow a complete examination of the evidence.

### 8.6.3 Toolmark Examination

#### 8.6.3.1 The toolmark examination process may be used to establish:

- Class of tool that made the toolmark
- Type of toolmark (striated, impressed, combination)
- The suitability of the toolmark for comparison purposes
- Direction of the toolmark

#### 8.6.3.2 Methods used to enhance toolmarks for further examination:

- Dusting the toolmark with fingerprint powder
- Magnesium smoking to reduce glare on shiny surfaces by coating with magnesium smoke to enhance microscopic examination

### 8.6.4 Test Media:

To perform a microscopic comparison of a submitted tool with a toolmark, test toolmarks must be produced with the suspect tool. The initial test media must be soft enough to prevent alterations of the tool's working surface, and lead is usually the preferred material. Additional tests might require the use of the material used in the original toolmark.

## 8.7 Casting

Casting is a procedure used in a toolmark examination to make a reverse image of a tool or toolmark, which can then be used for comparative microscopic examination purposes. If an item received for a toolmark examination is too large to be conveniently placed on the microscope's stages, a cast can be made of the tool or toolmark(s) in question. There are also occasions when a cast of a toolmark might be

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received as evidence. In either case, any test standards made will also have to be cast in order to perform a comparison.

- Apply the casting material over the tool or toolmark to be cast
- When casting material is set, remove the cast from the tool or toolmark
- Consideration must be given to placing identifying marks as well as orientation marks on the back of the cast, or scribe identifying marks and/or orientation marks onto the tool or toolmark being cast
- Record findings and observations in the notes

## 8.8 Tool mark Tests Produced

Tool mark tests may be produced from submitted evidence material or from laboratory stock material. These tests should be marked in accordance with the [Laboratory Operations Manual Section 4.3](#). All tool mark tests should be considered evidence generated in lab and as such have a chain of custody tracked in Forensic Advantage. Tool mark tests created that result in an identification or elimination should be returned to the submitting agency with all other evidence. Tool mark tests that are inconclusive may be disposed of after the examination is completed. The disposition in Forensic Advantage should be "Destroyed" with a notation in the Comments that the examination result was inconclusive.

## 8.9 Microscopic Comparison

Microscopic comparison of tools and tool mark(s) is detailed in Section 5 of the Firearm/Tool mark Procedures Manual.

### 8.9.1 Interpretation of Results

Identification: The class characteristics are the same, and there is sufficient agreement in the individual characteristics, as defined by the Association of Firearms and Tool Marks Examiners (AFTE) Criteria for Identification.

*Note: The significance of the identification (association) can only be qualified to the standard of practical certainty. Absolute or scientific certainty are not standards or terms that can be used to qualify the significance of the association between two items. See [Section 11 of the Firearms Procedure Manual](#) for the required statement for all reports that contain an identification of two or more items.*

Inconclusive (could not be identified or eliminated): The class characteristics are the same; however, there is not sufficient agreement in the individual characteristics or there are not sufficient individual characteristics present to make an identification. Additionally, there may be times where an item(s) displays potential subclass characteristics. If no tool or firearm is submitted for further analysis, there is not sufficient agreement of the individual characteristics present and/or subclass cannot be ruled out, a result of Inconclusive should be reported.

Elimination: Class characteristic(s) are different, machining marks on fired or tool mark evidence is not present on the firearm or tool being compared or groups of fired cartridge cases display differences in machining marks and individual characteristics.

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*Note: Class characteristics are defined by AFTE as: Measurable features of a specimen which indicate a restricted group source. They result from design factors and are determined prior to manufacture.*

Unsuitable: Evidence bears no marks suitable for microscopic comparison.

Interpretation of results is to be documented in examination notes and on the microscope worksheet. All identifications, except for test to test comparisons, shall be documented with a photomicrograph that clearly depicts a representative sample of the areas of identification.

It is recommended that photomicrographs be included in cases where machining marks and individual characteristics are used as elimination criteria.

Examinations that are determined to be inconclusive are not required to have documentation with photomicrographs. In the case of an elimination, it is at the examiner's discretion to document class characteristic differences using photomicrographs.

Annotations on all photomicrographs shall include, at a minimum, the date and time the observation was made, the item number(s) being examined or compared and their position (right or left), the lab number, the magnification being utilized, the examiner's last name and the purpose of the image (Identification, Elimination, Inconclusive...).

Microscope worksheet documentation should describe the following:

- The item used as the reference
- The specific area or areas of identification on the item(s)
- The type of mark or marks identified

It is at the examiner's discretion to use a drawing or diagram of the item(s) examined with notations of the areas of ID and type of marks if the above listed information is documented.

## 8.10 Appendices

[Appendix A - Calibration Standards](#)

## 8.11 References

"Mikrosil Casting Material Information" AFTE Journal Vol. 15, No. 2, p. 80

Barber, D.C. and Cassidy, F.H. "A New Dimension with 'Mikrosil' Casting Material" AFTE Journal Vol. 19, No. 3, p. 328

DeForest, Gaensslen, and Lee Forensic Science: An Introduction to Criminalistics McGraw-Hill: New York, 1983

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