

ASB Standard 100, First Edition  
2025

**Standard Scale and Criteria for Source Conclusions in  
Toolmark Examinations**

DRAFT



**ASB**  
**ACADEMY**  
**STANDARDS BOARD**

## Standard Scale and Criteria for Source Conclusions in Toolmark Examinations

ASB Approved Xxxxx 2025

ANSI Approved Xxxxxx 2025



**ASB**  
ACADEMY  
STANDARDS BOARD

410 North 21<sup>st</sup> Street  
Colorado Springs, CO 80904

This document may be downloaded from: [www.aafs.org/academy-standards-board](http://www.aafs.org/academy-standards-board)

*This document is provided free of cost by the AAFS Standards Board (ASB). Users are permitted to print and download the document and extracts from the document for personal use, however the following actions are prohibited under copyright:*

- *modifying this document or its related graphics in any way;*
- *using any illustrations or any graphics separately from any accompanying text; and,*
- *failing to include an acknowledgment alongside the copied material noting the AAFS Standards Board as the copyright holder and publisher.*

*Users may not reproduce, duplicate, copy, sell, resell, or exploit for any commercial purposes this document or any portion of it. Users may create a hyperlink to [www.aafs.org/academy-standards-board](http://www.aafs.org/academy-standards-board) to allow persons to download their individual free copy of this document. The hyperlink must not portray AAFS, the AAFS Standards Board, this document, our agents, associates and affiliates in an offensive manner, or be misleading or false. ASB trademarks may not be used as part of a link without written permission from ASB.*

*The AAFS Standards Board retains the sole right to submit this document to any other forum for any purpose.*

*Certain commercial entities, equipment or materials may be identified in this document to describe a procedure or concept adequately. Such identification is not intended to imply recommendations or endorsement by the AAFS or the AAFS Standards Board, nor is it intended to imply that the entities, materials, or equipment are necessarily the best available for the purpose.*

*Proper citation of ASB documents includes the designation, title, edition, and year of publication.*

*This document is copyrighted © by the AAFS Standards Board, LLC. 2025 All rights are reserved.  
410 North 21st Street, Colorado Springs, CO 80904, [www.aafs.org/academy-standards-board](http://www.aafs.org/academy-standards-board)*

## Foreword

This document was developed to provide a standard scale of conclusions and criteria to be used for toolmark examinations and comparisons by forensic firearm and toolmark examiners.

Throughout this document, the term “toolmark” is used to refer to both firearm produced and non-firearm produced toolmarks.

The American Academy of Forensic Sciences established the Academy Standards Board (ASB) in 2015 with a vision of safeguarding Justice, Integrity and Fairness through Consensus Based American National Standards. To that end, the ASB develops consensus based forensic standards within a framework accredited by the American National Standards Institute (ANSI), and provides training to support those standards. ASB values integrity, scientific rigor, openness, due process, collaboration, excellence, diversity and inclusion. ASB is dedicated to developing and making freely accessible the highest quality documentary forensic science consensus Standards, Guidelines, Best Practices, and Technical Reports in a wide range of forensic science disciplines as a service to forensic practitioners and the legal system.

This document was revised, prepared, and finalized as a standard by the Firearms and Toolmarks Consensus Body of the AAFS Standards Board. The draft of this standard was developed by the Firearms and Toolmarks Subcommittee of the Organization of Scientific Area Committees (OSAC) for Forensic Science.

Questions, comments, and suggestions for the improvement of this document can be sent to AAFS/ASB Secretariat, [asb@aaafs.org](mailto:asb@aaafs.org) or 410 N 21<sup>st</sup> Street, Colorado Springs, CO 80904.

All hyperlinks and web addresses shown in this document are current as of the publication date of this standard.

ASB procedures are publicly available, free of cost, at [www.aaafs.org/academy-standards-board](http://www.aaafs.org/academy-standards-board).

**Keywords:** *Firearm and toolmark source conclusions, scale of conclusions, criteria*

**Table of Contents** *(to be updated prior to publication)*

1 Scope.....

2 Normative References .....

3 Terms and Definitions .....

4 Requirements.....

4.1 Value Determinations .....

4.2 Scale of Source Conclusions and Related Criteria .....

5 Limitations .....

DRAFT

# 1 Standard Scale and Criteria for Source Conclusions in Toolmark Examinations

## 2 **1 Scope**

3 This standard provides a scale of conclusions and criteria to be used for all toolmark examinations  
4 and comparisons. These comparisons are conducted for the forensic purposes of determining  
5 whether or not two or more toolmarks could have been created by the same tool. This document is  
6 limited to the process of reaching source conclusions and does not address or consider other types  
7 of conclusions possible in the analysis of toolmark evidence.

## 8 **2 Normative References**

9 There are no normative reference documents. Annex A, Bibliography, contains informative  
10 references.

## 11 **3 Terms and Definitions**

12 For purposes of this document, the following definitions apply.

### 13 **3.1**

#### 14 **class characteristics**

15 physical features of a specimen which indicate a restricted group source

16 NOTE Class characteristics result from design and manufacturing decisions that are within acceptable  
17 manufacturing tolerances and are, therefore, determined prior to manufacture.

### 18 **3.2**

#### 19 **Known Same Source Toolmarks**

##### 20 **KSST**

21 toolmarks known to have been made by the same tool

22 Note KSST was also termed as known match (KM).

### 23 **3.3**

#### 24 **Known Different Source Toolmarks**

##### 25 **KDST**

26 toolmarks known to have been made by different tools or different working surfaces of the same  
27 tool

28 Note KDST was also termed as known non-match (KNM).

### 29 **3.4**

#### 30 **individual characteristics**

31 marks produced by the random imperfections or irregularities of tool surfaces, produced incidental  
32 to manufacture and/or caused by use, corrosion, or damage, and relevant for comparison between  
33 an individual item and a potential source

34 Note Individual characteristics are not expected to be seen in the same arrangement of detail repeated in  
35 another source.

36 AFTE Glossary [mod]

37 **3.5**  
38 **source conclusion**  
39 an opinion of same source, an opinion of different sources, or an inconclusive opinion

40 **3.6**  
41 **subclass characteristics**  
42 toolmarks produced during the manufacturing process that persist on a series of sequentially  
43 manufactured items fabricated by the same tool

44 NOTE These features are not determined prior to manufacture and are more restrictive than class  
45 characteristics.

46 **3.7**  
47 **task-relevant information<sup>1</sup>**  
48 information that is necessary for drawing conclusions:

- 49 a) about the propositions in question;
- 50 b) from the physical evidence that has been designated for examination;
- 51 c) through the correct application of an accepted analytic method by a competent  
52 analyst

## 53 **4 Requirements**

### 54 **4.1 Value Determinations**

#### 55 **4.1.1 General**

56 The examiner shall evaluate each item as defined in 4.1.2 and 4.1.3.

#### 57 **4.1.2 Of No Value (Unsuitable) for Source Conclusion**

58 The examiner shall render this opinion when the item lacks sufficient quality or quantity of  
59 features, size, or clarity suitable for source conclusions (e.g., an object that does not bear any class,  
60 subclass and/or individual characteristics). However, the item may have value to other paths of  
61 forensic inquiry (e.g., crime scene reconstruction).

#### 62 **4.1.3 Of Value for Source Conclusion**

63 When the examiner determines that the item under consideration has potentially sufficient class,  
64 subclass and/or individual characteristics for further evaluation, examination, or comparison with  
65 other known-source or questioned-source items for potential source conclusion, the examiner shall  
66 proceed with the examinations.

---

<sup>1</sup> Available from: <https://www.justice.gov/ncfs/file/818196/download>

67 **4.2 Scale of Source Conclusions and Related Criteria**

68 **4.2.1 Opinion of Different Source (Exclusion)**

69 **4.2.1.1 General**

70 An examiner shall render an opinion that toolmarks originated from different sources based on the  
71 criteria listed in 4.2.1.2. An opinion of different source is justified when the observed characteristics  
72 of the items in question provide a high level of support that they were marked by different tools  
73 and a low level or no support that they were marked by the same tool.

74 **4.2.1.2 Criteria for Opinion of Different Source (Exclusion)**

75 **4.2.1.2.1** An examiner shall render an opinion of different source when there is a demonstrable  
76 incompatibility in class characteristics between the items in question.

77 **4.2.1.2.2** If the discernable class characteristics are compatible, an examiner shall render an  
78 opinion of different source only if there are demonstrable differences in individual characteristics  
79 or potential subclass characteristics, such that the excluded toolmarks fall outside the range of  
80 variability of marks produced by the same tool (KSST).

81 Task-relevant information should be considered when determining if differences observed in the  
82 comparison of two toolmarks support an opinion of different source. These include, but are not  
83 limited to, the following:

84 a) when examining a suspect tool:

85 — evidence of potential alteration to the tool working surface;

86 — ability of the tool to consistently reproduce the individual characteristics;

87 — condition of the tool working surface or substrate (e.g., visible rust or corrosion);

88 — relative hardness of the tool working surface or substrate;

89 *EXAMPLE* A bolt cutter was used to cut the hardened steel shackles of padlocks. Since the  
90 tool is not much harder than the workpiece, the tool is damaged each time it is used to act  
91 upon the workpiece. Therefore, the tool may exhibit changes from that damage in the test  
92 marks produced.

93 — history of the tool, to the extent it can be established, including any known time interval  
94 between deposition of questioned toolmark(s) and collection of the tool, during which  
95 changes to the tool could have occurred due to use, abuse, or corrosion.

96 NOTE For the purpose of determining if an opinion of different source is warranted based on  
97 differences in individual characteristics, investigative details relating to the possible use or non-use  
98 of the suspected tool during the time interval between the criminal incident and the collection of the  
99 tool as evidence may be contextual task-relevant information because it may help the examiner draw  
100 an accurate forensic conclusion.

- 101 b) when examining questioned toolmarks:
- 102 — time interval between the production or collection of the questioned toolmarks, if related to  
103 different events;
- 104 — quantity and quality of any additional questioned toolmarks available for analysis, to the  
105 extent it can be determined that they represent a reliable range of variability of individual  
106 characteristics arising from the same source tool.

107 *EXAMPLE* A group of four questioned bullets determined to have been fired from the same  
108 unknown firearm based on consistently reproduced individual characteristics in the rifling  
109 impressions is compared to a bullet having no exclusionary differences in the discernible  
110 class characteristics but displaying sufficient disagreement of individual characteristics  
111 with the aforementioned group; in this example, the fifth bullet could justifiably be excluded  
112 (per the criteria in 4.2.1.2.2) as having been fired from the same firearm that marked the  
113 group of four bullets, if it can be assumed there are no factors (e.g., a lengthy time interval  
114 between the crime scenes, a difference in ammunition) that could possibly account for the  
115 observed disagreement.

## 116 4.2.2 Opinions of Inconclusive

### 117 4.2.2.1 General

118 An examiner shall render an inconclusive opinion as to the source of toolmarks based on the  
119 criteria listed in 4.2.2.2.1, 4.2.2.3.1, and 4.2.2.4.1. An inconclusive opinion is justified when there is  
120 agreement of discernible class characteristics, but there is insufficient agreement or disagreement  
121 of the individual characteristics observed on the items in question to support either the items  
122 were marked by the same tool or the items were marked by different tools. This source conclusion  
123 may be expressed as one general inconclusive statement (section 4.2.2.3), or can be further  
124 specified as described in the sections 4.2.2.2 and 4.2.2.4. The FSSP shall conduct a risk assessment  
125 to determine whether or not they choose to adopt categories 4.2.2.2 (insufficient support for  
126 opinion of different source (exclusion)) and 4.2.2.4 (insufficient support for opinion of same source  
127 (identification)). The FSSP shall have procedures that include what additional information beyond  
128 the term “inconclusive” can be added to the report and what, if any, additional quality control or  
129 documentation shall be required.

### 130 4.2.2.2 Insufficient Support for Opinion of Different Source (Exclusion)

#### 131 4.2.2.2.1 General

132 An examiner shall render an inconclusive opinion of Insufficient Support for Opinion of Different Source  
133 (Exclusion) based on the criteria listed in 4.2.2.2.2. This opinion is justified when the observed  
134 characteristics of the items in question provide support that they were marked by different tools coupled  
135 with low level or no support that they were marked by the same tool, but the differences are potentially  
136 within the range of variability of marks produced by the same tool (KSST) and are, therefore, insufficient  
137 for an Opinion of Different Source (Exclusion).



138 **4.2.2.2.2 Criteria for Insufficient Support for Opinion of Different Source (Exclusion)**

139 An examiner shall conclude that there is insufficient support for an opinion of different source (exclusion)  
 140 when there is agreement of discernible class characteristics and some differences in individual  
 141 characteristics or possible subclass characteristics, but potentially within the range of variability of marks  
 142 produced by the same tool (KSST).

143 **4.2.2.3 Insufficient Support for Either Opinion of Different Source (Exclusion) or Opinion of**  
 144 **Same Source (Identification)**

145 **4.2.2.3.1 General**

146 An examiner shall render an inconclusive opinion of Insufficient Support for Either Opinion of  
 147 Different Source (Exclusion) or Opinion of Same Source (Identification) based on the criteria listed  
 148 in 4.2.2.3.2. This opinion is justified when there is agreement of discernible class characteristics,  
 149 but, due to an absence of individual characteristics, lack of demonstrable agreement or  
 150 disagreement of individual characteristics, or lack of reproducibility of individual characteristics, no  
 151 other conclusion can be reached.

152 **4.2.2.3.2 Criteria for Insufficient Support for Either Opinion of Different Source (Exclusion)**  
 153 **or Opinion of Same Source (Identification)**

154 An examiner shall conclude that there is insufficient support for either an opinion of same source  
 155 (identification) or opinion of different source (exclusion) when there is insufficient agreement  
 156 and/or insufficient disagreement of observable characteristics.

157 **4.2.2.4 Insufficient Support for Opinion of Same Source (Identification)**

158 **4.2.2.4.1 General**

159 An examiner shall render an inconclusive opinion of Insufficient Support for Opinion of Same Source  
 160 (Identification) based on the criteria listed in 4.2.2.4.2. This opinion is justified when the observed  
 161 characteristics of the items in question provide support that they were marked by the same tool coupled  
 162 with low level or no support that they were marked by a different tool, but the similarities are potentially  
 163 outside the range of variability of marks produced by the same tool (KSST) and are, therefore, insufficient  
 164 for an Opinion of Same Source (Identification).

165 **4.2.2.4.2 Criteria for Insufficient Support for Opinion of Same Source (Identification)**

166 An examiner shall conclude that there is insufficient support for an opinion of same source  
 167 (identification) when there is agreement of discernible class characteristics and some agreement of  
 168 individual characteristics, but potentially within the range of agreement that has been  
 169 demonstrated by toolmarks made by different tools (KDST).

170 **4.2.2.5 Additional Considerations for Opinions of Inconclusive**

171 An examiner shall consider the following (non-exhaustive) conditions which may contribute to an  
 172 inconclusive opinion:

173 a) quantity/quality of individual characteristics;

- 174 b) variability of individual characteristics;
- 175 c) damage;
- 176 d) sample quality;
- 177 e) sample size;
- 178 f) potential subclass characteristics.

### 179 **4.2.3 Opinion of Same Source (Identification)**

#### 180 **4.2.3.1 General**

181 An examiner shall render an opinion that toolmarks originated from the same source based on the  
182 criteria listed in 4.2.3.2. An opinion of same source is justified when the observed characteristics of  
183 the items in question provide a high level of support that they were marked by the same tool and  
184 low level or no support that they were marked by different tools.

#### 185 **4.2.3.2 Criteria for Opinion of Same Source (Identification)**

186 If the discernable class and subclass characteristics are compatible, an examiner shall render an  
187 opinion that toolmarks originated from the same source only if there are demonstrable similarities  
188 in individual characteristics, such that the toolmarks fall within the range of variability of marks  
189 produced by the same tool (KSST) and the agreement exceeds that which has been demonstrated  
190 by toolmarks made by different tools (KDST).

191 Task-relevant information should be considered when determining if similarities observed in the  
192 comparison of two toolmarks support an opinion of same source including, but not limited to, the  
193 following:

- 194 — ability of the individual characteristics on the tool surface to be reproduced;
- 195 — condition of the tool working surface or substrate, if available;
- 196 — relative dates of collection of all evidence.

## 197 **5 Limitations**

198 A source conclusion is ultimately an examiner's opinion and as such is necessarily subjective,  
199 potentially subject to error, and cannot be made to the exclusion of all other tools, or to any specific  
200 degree of certainty. Care must be taken when choosing terminology; terms such as "unique" or  
201 "individualize" can imply that a source conclusion is justified without fairly representing the  
202 significance of the science or data.

203 The examiner shall be aware of and intercept the negative effects of bias at the points they impact  
204 the process of making source conclusions.

205 The FSSP shall have a policy regarding the expression of source conclusions through testimony, lab  
206 reports, lab notes, and other written or verbal communications to include suitable limitations. At a  
207 minimum, the FSSP shall include in the policy that an examiner shall not assert that two toolmarks

208 originated from the same source to any numerical/statistical degree of certainty and cannot be  
209 made to the exclusion of all other tools. The examiner should be familiar with contemporary  
210 statements pertaining to these issues.<sup>2</sup>

211

212

213

214

215

216

217

DRAFT

---

<sup>2</sup> <https://www.justice.gov/olp/page/file/1284766/download>

218  
219

**Annex A**  
**(informative)**

220

**Bibliography**

221 This is not meant to be an all-inclusive list; other publications on this subject may exist. At the time  
222 this standard was drafted, these were the publications available for reference. Examiners should  
223 take into consideration the current state of professional practice and scientific research.

224 1] AFTE Criteria for Identification Committee "Theory of Identification, Range of Striae  
225 Comparison Reports and Modified Glossary Definitions - AFTE Criteria for Identification  
226 Committee Report." *AFTE Journal*, 1992, Vol. 24(3), pp. 336-338.

227

228 2] AFTE Glossary<sup>3</sup>

229

---

<sup>3</sup> Available from: [https://afte.org/uploads/documents/AFTE\\_Glossary\\_Version\\_6.091922\\_FINAL\\_COPYRIGHT.pdf](https://afte.org/uploads/documents/AFTE_Glossary_Version_6.091922_FINAL_COPYRIGHT.pdf)

DRAFT



**ASB**  
**ACADEMY**  
**STANDARDS BOARD**

Academy Standards Board  
410 North 21st Street  
Colorado Springs, CO 80904

[www.aafs.org/academy-standards-board](http://www.aafs.org/academy-standards-board)