

Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794

Part 2: Finger minutiae data

ICS 35.040

National foreword

This British Standard is the UK implementation of ISO/IEC 29109-2:2010.

The UK participation in its preparation was entrusted to Technical Committee IST/44, Biometrics.

A list of organizations represented on this committee can be obtained on request to its secretary.

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**Information technology — Conformance
testing methodology for biometric data
interchange formats defined in
ISO/IEC 19794 —**

**Part 2:
Finger minutiae data**

*Technologies de l'information — Méthodologie d'essai de conformité
pour les formats d'interéchange de données biométriques définis dans
l'ISO/CEI 19794 —*

Partie 2: Données de point caractéristique de doigt



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents		Page
Foreword		iv
Introduction.....		v
1	Scope	1
2	Conformance	1
3	Normative references	2
4	Terms and definitions	2
5	Symbols and abbreviated terms	2
6	Conformance testing methodology	2
6.1	General	2
6.2	Table of requirements in the base standard.....	2
6.3	Tables of Test Assertions.....	19

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 29109-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

ISO/IEC 29109 consists of the following parts, under the general title *Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794*:

- *Part 1: Generalized conformance testing methodology*
- *Part 2: Finger minutiae data*
- *Part 4: Finger image data*
- *Part 5: Face image data*
- *Part 6: Iris image data*
- *Part 8: Finger pattern skeletal data*
- *Part 9: Vascular image data*
- *Part 10: Hand geometry silhouette data*

The following parts are under preparation:

- *Part 3: Finger pattern spectral data*
- *Part 7: Signature/sign time series data*
- *Part 11: Signature/sign processed dynamic data*
- *Part 13: Voice data*
- *Part 14: DNA data*

Introduction

ISO/IEC 19794-2 specifies data interchange formats for recording, storing and transmitting one or more finger minutiae records, possibly within a Common Biometric Exchange Formats Framework (CBEFF) data structure. Each minutia may be accompanied by subject-specific metadata contained in a header record. This part of ISO/IEC 29109 defines tests for checking the correctness of the binary record.

The requirements of ISO/IEC 19794-2 cannot be completely achieved until biometric products can be tested to determine whether they conform to its specifications. Conforming implementations are a necessary prerequisite for achieving interoperability among implementations; there is therefore a need for a standardized conformance testing methodology, test assertions and test procedures, as applicable to specific modalities addressed by each part of ISO/IEC 19794. The test assertions will cover as much as is practical of the ISO/IEC 19794 requirements (covering the most critical features), so that the conformity results produced by the test suites will reflect the real degree of conformity of the implementations to ISO/IEC 19794 Data Interchange Format records. This is the motivation for the development of this conformance testing methodology.

This part of ISO/IEC 29109 supports those applications that require use of finger minutiae data according to ISO/IEC 19794-2:2005. It defines a testing methodology to assure conformance of a vendor's application or service to the base ISO/IEC 19794-2:2005 specification. Thus, it is intended to:

- establish elements of the Conformance Testing Methodology framework that are specific to the Finger Minutiae-based Data Record requirements of ISO/IEC 19794-2:2005 conformance testing,
- define requirements and guidelines for specifying conformance test suites and related test methods for measuring conformity of products and services to the Finger Minutiae-based Data Record requirements of ISO/IEC 19794-2:2005, and
- define test and reporting procedures to be followed before, during and after conformance testing.

This part of ISO/IEC 29109 is applicable to the development and use of conformity test method specifications, conformity test suites for ISO/IEC 19794-2:2005 records, and conformance testing programs for ISO/IEC 19794-2:2005 conformant products. It is intended primarily for use by testing organizations, but may be applied by developers and users of test method specifications and test method implementations.

Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794 —

Part 2: Finger minutiae data

1 Scope

This part of ISO/IEC 29109 specifies elements of conformance testing methodology, test assertions and test procedures, as applicable to the biometric data interchange format standard relating to finger minutiae data (i.e. ISO/IEC 19794-2).

It establishes

- tests of assertions of the structure of the finger minutiae data format as specified in ISO/IEC 19794-2:2005 (Type A Level 1 as defined in ISO/IEC 29109-1:2009),
- tests of assertions of internal consistency by checking the types of values that may be contained within each field (Type A Level 2 as defined in ISO/IEC 29109-1:2009), and
- tests of semantic assertions (Type A Level 3 as defined in ISO/IEC 29109-1:2009).

This part of ISO/IEC 29109 does not establish

- tests of conformance of CBEFF structures embedding ISO/IEC 19794-2:2005 biometric data blocks (BDBs),
- tests of other characteristics of biometric products or other types of testing of biometric products (e.g. acceptance, performance, robustness, security),
- tests of conformance of systems that do not produce ISO/IEC 19794-2:2005 records, or
- tests for Level 3 conformance testing.

2 Conformance

Biometric data interchange format conformance tests conform to this part of ISO/IEC 29109 if they satisfy all of the normative requirements related to Clause 6. Specifically, they shall use the test methodology specified in ISO/IEC 29109-1:2009, Clauses 6, 7 and 8, and all Level 1 and Level 2 tests shall use the assertions defined in Table 2.

Implementations of ISO/IEC 19794-2:2005 tested according to the methodology specified shall be able to claim conformance only to those Biometric Data Record (BDR) requirements specified in ISO/IEC 19794-2:2005 that are tested by the test methods established by this methodology.

Implementations of ISO/IEC 19794-2:2005 do not necessarily need to conform to all possible aspects of ISO/IEC 19794-2:2005, but only to those ISO/IEC 19794-2:2005 requirements that are claimed to be supported by the implementation in an Implementation Conformance Statement, filled out in accordance with Table 1 of this part of ISO/IEC 29109 and ISO/IEC 29109-1:2009, Clause 8.

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 19794-2:2005, *Information technology — Biometric data interchange formats — Part 2: Finger minutiae data*

ISO/IEC 19794-2:2005/Cor.1:2009, *Information technology — Biometric data interchange formats — Part 2: Finger minutiae data — Technical corrigendum 1*

ISO/IEC 29109-1:2009, *Information technology — Conformance testing methodology for biometric data interchange formats defined in ISO/IEC 19794 — Part 1: Generalized conformance testing methodology*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 29109-1 apply.

5 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO/IEC 29109-1 apply.

6 Conformance testing methodology

6.1 General

The testing methodology specified in ISO/IEC 29109-1:2009, Clauses 6, 7 and 8 shall be used. The content of the tables below is based on the conformance testing methodology outlined in 29109-1 and shall only be used in the context of that testing methodology.

6.2 Table of requirements in the base standard

The normative requirements of ISO/IEC 19794-2:2005, are listed in Table 1. The supplier of the IUT can explain which optional components of the standard are supported and the testing laboratory can note the results of the test.

Table 1 — Requirements of the Base Standard (19794-2:2005)

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability										IUT Support	Supported Range	Test Result
					1	2	3	4	5	6	25	26	27	28			
R-1	6.2	Some points are neither a ridge ending nor a bifurcation. This standard therefore defines additionally a type named "other", which shall be used in such a way that the matching conditions specified in clause 6.5 apply. The "other" minutiae type shall not be used for minutiae that are ridge endings or ridge bifurcations.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		N/A	
R-2	6.3.1	The coordinate system used to express the minutiae of a fingerprint shall be a Cartesian coordinate system. Points shall be represented by their X and Y coordinates. The origin of the coordinate system shall be the upper left corner of the original image with X increasing to the right and Y increasing downward. The X and Y coordinates of the minutiae shall be in pixel units, with the spatial resolution of a pixel given in the "X Resolution" and "Y Resolution" fields of the format.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		N/A	N/A
R-3	6.3.2	The minutia for a ridge ending shall be defined as the point of forking of the medial skeleton of the valley area immediately in front of the ridge ending.	3C	O-1	Y	Y	Y	N	Y	N	Y	N	Y	N		N/A	N/A
R-4	6.3.3	The minutia for a ridge bifurcation shall be defined as the point of forking of the medial skeleton of the ridge. If the ridges were thinned down to a single-pixel-wide skeleton, the point where the three legs intersect is the location of the minutia.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		N/A	N/A

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability									IUT Support	Supported Range	Test Result
					1	2	3	4	5	6	25	26	27	28		
R-5	6.3.4	The minutia for a ridge skeleton endpoint shall be defined as the center point of the ending ridge.	3C	O-1	N	N	N	Y	N	Y	N	Y	N	Y	N/A	N/A
R-6	6.3.5	For minutia other than a bifurcation or ridge ending the position and angle calculations shall be done in such a way that the matching conditions in clause 6.5 apply.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
R-7	6.5	Core direction: If the core has a discernible angle of direction, it shall be recorded in the core information, since this characterizes the type of core.	3C	O-1	Y	N	N	N	N	N	N	N	N	N	N/A	N/A
R-8	6.5	Delta direction: For all observable divergences the angle is defined by the direction of the tangent before the pair of ridges beings to diverge. The angle shall point from divergent towards parallel ridge lines; that is, the angles shall point outwards from the delta.	3C	O-1	Y	N	N	N	N	N	N	N	N	N	N/A	N/A
R-9	6.6	In a matching process, the different minutia types shall be matched according to the following Table 1. Matchers may choose to assign lower weights (or importance) to a match of type 00 to 01 or 10, than to a match of type 00 to 00, 01 to 01, or 10 to 10.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A
R-10	6.7	All multibyte quantities are represented in Big-Endian format; that is, the more significant bytes of any multibyte quantity are stored at lower addresses in memory than (and are transmitted before) less significant bytes. All numeric values are fixed-length integer quantities, and are unsigned quantities.	1	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N/A	N/A

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability										IUT Support	Supported Range	Test Result
					1	2	3	4	5	6	25	26	27	28			
R-11	7.1	The minutiae record format shall be used to achieve interoperability between finger matchers providing a one-to-one verification.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		N/A	N/A
R-12	7.1	The minutia data shall be represented in a common format, containing both basic and extended data. With the exception of the Format Identifier and the Version number for the standard, which are null-terminated ASCII character strings, all data is represented in binary format.	1	M	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			
R-13	7.3	There shall be one and only one record header for the minutiae record, to hold information describing the type and characteristics of device that generated the minutia data.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-14	7.3.1	The Finger Minutiae Record shall begin with the three ASCII characters "FMR" followed by a zero byte as a NULL string terminator.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-15	7.3.2	The version number for the version of this standard used in constructing the minutiae record shall be placed in four bytes. This version number shall consist of three ASCII numerals followed by a zero byte as a NULL string terminator. The first and second character will represent the major revision number and the third character will represent the minor revision number. The version number is "20" (an ASCII space followed by an ASCII '2' and an ASCII '0').	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability										IUT Support	Supported Range	Test Result	
					1	2	3	4	5	6	25	26	27	28				
R-16	7.3.3	The length of the entire record shall be recorded in four bytes.	1	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-17	7.3.4	If the most significant bit is '1', the original capture equipment was certified to be compliant with the specifications in Annex B, copied from the US Federal Bureau of Investigation's Image Quality Specifications, Appendix F. The least significant of the four bits is reserved for a future ISO finger image capture equipment certification. The two additional bits are reserved for future image quality certifications.	3C	O-1	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N/A	N/A	N/A
R-18	7.3.5	The capture device type ID shall be recorded in twelve bits.	1	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-19	7.3.6	The size of the original image in pixels in the X direction shall be contained in two bytes.	1	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-20	7.3.7	The size of the original image in pixels in the Y direction shall be contained in two bytes.	1	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-21	7.3.8	The resolution of the minutiae coordinate system shall be recorded in two bytes having the units of pixels per centimeter. The value of the X resolution shall not be less than 98.45 pixels per centimeter (250 pixels per inch).	1	M	Y	Y	Y	Y	Y	Y	Y	N	N	N	N			

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability										IUT Support	Supported Range	Test Result
					1	2	3	4	5	6	25	26	27	28			
R-22	7.3.9	The resolution of the minutiae coordinate system shall be recorded in two bytes having the units of pixels per centimeter. The value of the Y resolution shall not be less than 98.45 pixels per centimeter (250 pixels per inch).	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-23	7.3.10	The total number of finger views contained in the minutiae record shall be recorded in one byte.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-24	7.3.10	In cases where there is more than one view of any finger, this number will be greater than the number of fingers.	2	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-25	7.3.11	This field is reserved for future use, and to align the end of the record header on a long-word (four byte) boundary. For the current version of the standard, this field shall be set to zero.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-26	7.4.1	A finger header shall start each section of finger data providing information for that finger. There shall be one finger header for each finger contained in the finger minutiae record. The finger header will occupy a total of four bytes as described below.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			
R-27	7.4.1.1	The finger position shall be recorded in one byte. The codes for this byte shall be as defined in Table 2.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N			

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Subformat Applicability									IUT Support	Supported Range	Test Result
					1	2	3	4	5	6	25	26	27	28		
R-28	7.4.1.2	The view number shall be recorded in four bits.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N		
R-29	7.4.1.2	If more than one finger minutiae record in a general record is from the same finger, each minutiae record shall have a unique view number. The combination of finger location and view number shall uniquely identify a particular minutiae record within a general record.	2	M	Y	Y	Y	Y	Y	Y	N	N	N	N		
R-30	7.4.1.2	Multiple finger minutiae records from the same finger shall be numbered with increasing view numbers, beginning with zero. Where only one finger minutiae record is taken from each finger, this field shall be set to 0.	2	M	Y	Y	Y	Y	Y	Y	N	N	N	N		
R-31	7.4.1.3	The impression type of the finger images that the minutiae data was derived from shall be recorded in four bits. The codes for this byte are shown in Table 3.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N		
R-32	7.4.1.4	The quality of the overall finger minutiae data shall be between 0 and 100 and recorded in one byte.	1	M	Y	Y	N	N	N	N	N	N	N	N		
R-33	7.4.1.5	The number of minutiae recorded for the finger shall be recorded in one byte.	1	M	Y	Y	Y	Y	Y	Y	N	N	N	N		
R-34	7.4.2	The finger minutiae data for a single finger shall be recorded in blocks of six bytes per minutia.	2	M	Y	Y	N	N	N	N	N	N	N	N		