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

Part 8:

**Finger pattern skeletal data**

iTeh STANDARD PREVIEW

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

ISO/IEC 29109-8:2011

*Partie 8: Données des structures du squelette de l'empreinte*

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## 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 29109-8 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 7: Signature/sign time series data*
- *Part 8: Finger pattern skeletal data*
- *Part 9: Vascular image data*
- *Part 10: Hand geometry silhouette data*

Finger pattern spectral data, signature/sign processed dynamic data, voice data and DNA data will form the subjects of future parts.

## Introduction

ISO/IEC 19794-8:2006 specifies a data record interchange format for exchange of finger pattern skeletal data among systems within a Common Biometric Exchange Formats Framework (CBEFF) data structure. The data stored in a finger pattern skeletal data record often contains the metadata storing the subject-specific, the image-specific as well as the technology being used. This part of ISO/IEC 29109 establishes tests for checking the correctness of the binary record.

The objective of ISO/IEC 19794-8:2006 cannot be completely achieved until biometric products can be tested to determine whether they conform to those specifications. Conforming implementations are a necessary prerequisite for achieving interoperability among implementations; therefore there is 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 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 pattern skeletal data according to ISO/IEC 19794-8:2006. It defines a testing methodology to ensure conformance of a vendor's application or service to the base ISO/IEC 19794-8:2006 specification. Thus this part of ISO/IEC 29109 is intended to:

- establish elements of the conformance testing methodology framework that are specific to the finger pattern skeletal-based data record requirements of ISO/IEC 19794-8:2006 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 pattern skeletal data record requirements of ISO/IEC 19794-8:2006, and
- define testing 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 19794-8:2006 records, and conformance testing programs for ISO/IEC 19794-8:2006 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.

The table of test assertions (Clause 6.2) specifies levels 1, 2 or 3 testing for the conformance requirements of ISO/IEC 19794-8:2006.

Conformance testing of CBEFF requirements will be out of the scope of ISO/IEC 29109.

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

## Part 8: Finger pattern skeletal data

### 1 Scope

This part of ISO/IEC 29109 specifies elements of conformance testing methodology, test assertions, and test procedures as applicable to ISO/IEC 19794-8:2006.

This part of ISO/IEC 29109 establishes

- test assertions of the structure of the finger pattern skeletal data format as specified in ISO/IEC 19794-8:2006 (Type A Level 1 as defined in ISO/IEC 29109-1:2009),
- test assertions of internal consistency (checking the types of values that may be contained within each field (Type A Level 2 as defined in ISO/IEC 29109-1:2009).

This part of ISO/IEC 29109 does not establish

- test of conformance of CBEFF structures required by ISO/IEC 19794-8:2006,
- test of consistency with input biometric data record (Level 3),
- test of other characteristics of biometric products or other types of testing of biometric products (e.g. acceptance, performance, robustness, security),
- test of conformance of systems that do not produce ISO/IEC 19794-8:2006 records.

### 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 Clauses 6, 7 and 8 of ISO/IEC 29109-1:2009, and all Level 1 and Level 2 tests shall use the assertions defined in Table 2 of Clause 6 in this International Standard.

Implementations of ISO/IEC 19794-8:2006 tested according to the methodology specified shall be able to claim conformance only to those Biometric Data Record (BDR) requirements specified in ISO/IEC 19794-8:2006 that are tested by the test methods established by this methodology.

Implementations of ISO/IEC 19794-8:2006 do not necessarily need to conform to all possible aspects of ISO/IEC 19794-8:2006, but only to those ISO/IEC 19794-8:2006 requirements that are claimed to be supported by the implementation in an ICS, filled out in accordance with Clause 8 of ISO/IEC 29109-1:2009 and Table 1 of this part of ISO/IEC 29109.

### 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 19794-8:2006, *Information technology — Biometric data interchange formats — Part 8: Finger pattern skeletal data*

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 29109-1:2009 apply.

### 6 Conformance testing methodology

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

#### 6.1 Table of requirements in the base standard

Under subformat applicability the columns labelled R, N and C indicate Finger pattern skeletal data record format, Normal size finger pattern skeletal format and Compact size finger pattern skeletal format.



Table 1 — Requirements of the Base Standard (ISO/IEC 19794-8:2006)

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Sub-format / Format Type Applicability			IUT Support	Supported Range	Test Result
					R	N	C			
R-1	6.1.1	Minutiae are points located at the places in the fingerprint image where friction ridges end or split into two ridges. Each minutia point has a "type" associated with it. There are two major types of minutia: a "ridge ending" represented by the 2-bit value 01 and a "ridge bifurcation" or split point represented by 2-bit value 10.	1	M	Y	Y	Y			
R-2	6.1.2	The coordinate system used to express the position of the minutiae points of a fingerprint shall be a Cartesian coordinate system. For the skeletal pattern card format, the resolution of the x and y coordinates of the minutia shall be in metric units. The position of the minutia for a ridge ending shall be defined as the coordinates of the skeleton point with only one neighbour pixel belonging to the skeleton. The position of the minutia for a ridge bifurcation shall be defined as the point of forking of the skeleton of the ridge. The position of a virtual ending shall be defined like the position of a real ridge ending.	3C	O-1	Y	Y	Y		N/A	N/A
R-3	6.1.3	The direction of the lines starting or ending at a point with more than three arms (trifurcation, etc.) shall be defined like the direction of a real ridge ending. The direction of a virtual ending shall be defined like the direction of a real ridge ending.	3C	O-1	Y	Y	Y		N/A	N/A
R-4	6.2.2	To keep the encoding size small a line shall start with a real minutia (type 01 or 10) if possible. No assumption shall be made about the order of the line encodings in the record. The skeleton shall be encoded only for image areas where the ridge lines are displayed with a sufficient quality. The reconstructed ridge lines shall describe the fingerprint image in ridge position and structure. The reconstructed skeleton line polygon element shall be inside the area of the ridge it is describing for most part of its length.	3C	O-1	Y	Y	Y		N/A	N/A

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Sub-format / Format Type Applicability			IUT Support	Supported Range	Test Result
		The reconstructed skeleton line shall never be inside the area of any other ridge but the one it is describing. The reconstructed skeleton line shall preserve the topology of the ridges.								
R-5	6.2.3	In order to minimize integration of digitalisation error, each starting point must be computed with relatively high accuracy, i.e. its resolution shall be at least 100 times finer than the spatial resolution of the minutiae.	3C	O-1	Y	Y	Y		N/A	N/A
R-6	6.2.3	If the direction change of the skeleton line cannot be described by a direction element, the line encoding shall be interrupted by a "virtual continuation" and a new line encoding shall begin with the same point without repeating the minutia data.	3C	O-1	Y	Y	Y		N/A	N/A
R-7	6.3.2	It is not useful to list a neighbourhood relation twice, any of the other indices shall be different i.e. Ai-1>Ai	3A	M	Y	Y	Y			
R-8	7.3, Table 5	There shall be one and only one record header for the finger pattern skeletal data record. The record header will contain information describing the identity and characteristics of the device that generated the data.	3A	M	Y	N	N			
R-9	7.3.1, Table 5	The finger pattern skeletal data record shall begin with a format identifier to be recorded in four bytes. For this part of ISO/IEC 19794, it shall consist of the three ASCII characters "FSK", followed by a zero byte as a NULL string terminator.	1	M	Y	N	N			
R-10	7.3.2, Table 5	The version number for the version of this part of ISO/IEC 19794 used in constructing the record shall be placed in four bytes.	1	M	Y	N	N			
R-11	7.3.2, Table 5	The first and second character will represent the major revision number and the third character will represent the minor revision number. Upon approval of this specification, the version number shall be "010" (an ASCII '0' followed by an ASCII '1' and an ASCII '0').	1	M	Y	N	N			
R-12	7.3.3, Table 5	The length of the entire record shall be recorded in four bytes.	1	M	Y	N	N			

Requirement Identifier	Reference in Base Standard	Requirement Summary	Level	Status	Sub-format / Format Type Applicability			IUT Support	Supported Range	Test Result
R-13	7.3.4, Table 5	The least significant of the four bits is reserved for a future ISO finger image capture equipment certification.	1	O	Y	Y	Y			
R-14	7.3.4, Table 5	The two additional bits are reserved for future image quality certifications.	1	O	Y	Y	Y			
R-15	7.3.5, Table 5	The capture device type ID shall be recorded in twelve bits.	1	M	Y	Y	Y			
R-16	7.3.6, Table 5	The total number of finger views represented in the record shall be contained in 1 byte.	1	M	Y	Y	Y			
R-17	7.3.7, Table 5	The resolution (in ppcm) of the scaled finger image(s) shall be uniform in the x and y-directions and shall be stored in 1 byte	1	M	Y	N	N			
R-18	7.3.8, Table 5	The bit-depth used to represent the x and y-coordinate of the starting and ending point in the direction code description of the skeleton shall be recorded in 1 byte.	1	M	Y	N	N			
R-19	7.3.9, Table 5	The bit-depth used to represent the direction of the starting and ending point in the direction code description of the skeleton shall be recorded in 1 byte.	1	M	Y	N	N			
R-20	7.3.10, Table 5	The bit-depth used to represent the direction in the direction code shall be recorded in 1 byte.	1	M	Y	N	N			
R-21	7.3.11, Table 5	The maximal step size $S_s$ in the current direction of each direction code step shall be recorded in 1 byte.	1	M	Y	N	N			
R-22	7.3.12, Table 5	The relative perpendicular step size $\text{floor}(256 \times S_p/S_s)$ of the direction code shall be recorded in 1 byte.	1	M	Y	N	N			
R-23	7.3.13, Table 5	The angular resolution of the direction code is stored as the number $N\pi$ of directions on $180^\circ$ and shall be recorded in 1 byte.	1	M	Y	N	N			
R-24	7.3.14, Table 5	Two bytes are reserved for future revision of this specification. For version 1.0 of this part of ISO/IEC 19794, these byte values shall be set to 0.	1	M	Y	Y	Y			
R-25	7.4.1	A finger header shall start each area of finger data providing information for that finger. There shall be one finger header for each finger contained in the finger pattern skeletal data record. The finger header will occupy a total of 10 bytes as described below. Note that it is permissible for more than one single finger record to represent the same finger, with (presumably) different data.	1	M	Y	Y	Y			