

FINAL  
DRAFT

INTERNATIONAL  
STANDARD

ISO/IEC  
FDIS  
29794-1

ISO/IEC JTC 1/SC 37

Secretariat: ANSI

Voting begins  
on: 2015-09-16

Voting terminates  
on: 2015-11-16

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## Information technology — Biometric sample quality —

### Part 1: Framework

*Technologies de l'information — Qualité d'échantillon biométrique —  
Partie 1: Cadre*

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Reference number  
ISO/IEC FDIS 29794-1:2015(E)

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# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Conformance</b> .....	<b>1</b>
<b>3 Normative references</b> .....	<b>1</b>
<b>4 Terms and definitions</b> .....	<b>1</b>
<b>5 Abbreviated terms</b> .....	<b>3</b>
<b>6 Biometric sample quality criteria</b> .....	<b>4</b>
6.1 Reference model.....	4
6.2 Quality components: character, fidelity, utility.....	5
6.3 Usefulness of quality data.....	5
6.3.1 Real-time quality assessment.....	5
6.3.2 Use in different applications.....	6
6.3.3 Use as a survey statistic.....	6
6.3.4 Accumulation of relevant statistics.....	6
6.3.5 Reference dataset improvement.....	6
6.3.6 Quality-based conditional processing.....	6
6.3.7 Interchange of quality data by disparate systems.....	7
<b>7 Data interchange format field definition</b> .....	<b>7</b>
7.1 Binary encoding.....	7
7.2 XML encoding.....	9
7.3 Quality score.....	10
7.3.1 Purpose.....	10
7.3.2 Data transformation considerations.....	10
7.3.3 Failure modes.....	10
7.3.4 Resolution.....	10
7.3.5 Summarisation.....	10
7.4 Quality algorithm identification.....	10
7.4.1 Overview.....	10
7.4.2 Methodology.....	11
7.5 Standardized exchange of quality algorithm results.....	11
<b>8 Normalisation</b> .....	<b>12</b>
<b>Annex A (informative) Example of encoding a biometric quality record</b> .....	<b>13</b>
<b>Annex B (informative) Example of standardized exchange of quality algorithm results</b> .....	<b>14</b>
<b>Annex C (informative) Procedures for aggregation of utility-based quality scores</b> .....	<b>16</b>
<b>Bibliography</b> .....	<b>19</b>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

This second edition cancels and replaces the first edition (ISO/IEC 29794-1:2009), which has been technically revised to delete [Clause 6](#) and revise [Clause 8](#) and [Table 2](#), which describes the structure of quality record.

ISO/IEC 29794 consists of the following parts, under the general title *Information technology — Biometric sample quality*:

- *Part 1: Framework*
- *Part 4: Finger image data*
- *Part 5: Facial image data* [Technical Report]
- *Part 6: Iris image data*

ISO/IEC 29794 series is prepared to accommodate new, additional parts that address other modalities specified by ISO/IEC 19794, with part numbers and titles aligning appropriately. However, as Part 1 is intended for use by all modalities, a modality does not necessarily need a modality-specific part in order to make use of quality scores.

It is anticipated that a future version of each part of the ISO/IEC 19794 series will reference this part of ISO/IEC 29794 normatively, and their respective data fields will be updated as required.

## Introduction

Quality metrics are useful for several applications in the field of biometrics. While ISO/IEC 19784-1 specifies a structure and gives guidelines for quality score categorization, ISO/IEC 29794 defines and specifies methodologies for objective, quantitative quality score expression, interpretation, and interchange. This International Standard is intended to add value to a broad spectrum of applications in a manner that encourages competition, innovation, interoperability and performance improvements, and avoids bias towards particular applications, modalities, or techniques.

This International Standard presents several biometric sample quality scoring tools, the use of which is generally optional but can be determined as mandatory by particular Application Profiles or specific implementations.

A number of applications can benefit from the use of biometric sample quality data; an example is the use of real-time quality feedback upon enrolment to improve the operational efficiency and performance of a biometric system. The association of quality data with biometric samples is an important component of quality metric standardization. Quality fields as specified in 7.1 and 7.2 will be incorporated into data interchange formats. If a CBEFF header is present, then CBEFF\_BDB\_quality may additionally be used to express quality data. Useful analyses can be performed using quality data along with other data in order to improve the performance of a biometric system. For example, correlating quality data to other system metrics can be used to diagnose problems and highlight potential areas of performance improvement.

This edition introduces encoding of a vector of quality metrics.

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# Information technology — Biometric sample quality —

## Part 1: Framework

### 1 Scope

This part of ISO/IEC 29794, for any or all biometric sample types as necessary, establishes the following:

- terms and definitions that are useful in the specification and use of quality metrics;
- purpose and interpretation of biometric quality scores;
- encoding of quality data fields in biometric data interchange formats;
- methods for developing biometric sample datasets for the purpose of quality score normalisation;
- format for exchange of quality algorithm results;
- methods for aggregation of quality scores.

The following are outside the scope of this part of ISO/IEC 29794:

- specification of minimum requirements for sample, module, or system quality scores;
- performance assessment of quality algorithms;
- standardization of quality algorithms.

### 2 Conformance

A biometric sample quality record shall conform to this part of ISO/IEC 29794 if its structure and data values conform to the formatting requirements of [Clause 7](#). Conformance to normative requirements of [7.1](#) and [7.2](#) fulfils Level 1 and Level 2 conformance as specified in ISO/IEC 19794-1:2011, Annex A. Conformance to normative requirements of [7.3](#) is Level 3 conformance as specified in ISO/IEC 19794-1:2011, Annex A.

### 3 Normative references

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

ISO/IEC 19794-1:2011, *Information technology — Biometric data interchange formats — Part 1: Framework*

ISO/IEC 19785-1, *Information technology — Common Biometric Exchange Formats Framework — Part 1: Data element specification*

ISO/IEC 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*

### 4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37, ISO/IEC 19794-1 and the following apply.

**4.1 acquisition fidelity**

*fidelity* (4.6) of a sample attributed to the acquisition process

**4.2 character**

contributor to *quality* (4.11) of a sample attributable to inherent properties of the *source* (4.17)

**4.3 environment**

physical surroundings and conditions where biometric capture occurs, including operational factors such as *operator* (4.9) skill and enrollee cooperation level

**4.4 extraction fidelity**

component of the *fidelity* (4.6) of a sample attributed to the biometric feature extraction process

**4.5 extrinsic**

when used to describe a *quality score* (4.12), requiring reference to an external *source* (4.17), such as a standard, register, or technical specifications for full *interpretation* (4.8) and normalisation

**4.6 fidelity**

expression of how accurately a biometric sample represents its *source* (4.17) biometric characteristic

Note 1 to entry: The fidelity of a sample comprises components attributable to one or more of the processing steps: acquisition, extraction, signal processing.

**4.7 intrinsic**

when used to describe a *quality score* (4.12), conveying fully interpreted, normalised data without the requirement for additional *extrinsic* (4.5) information for *quality score normalisation* (4.13)

**4.8 interpretation**

process of analysing a *quality score* (4.12) along with other data in order to give that score contextual, relative meaning

**4.9 operator**

individual who processes a capture subject in a biometric system, performing or supervising capture and recapture

**4.10 performance**

assessment of false match rate, false non-match rate, failure to enrol rate and failure to acquire rate of a biometric system

**4.11 quality**

degree to which a biometric sample fulfils specified requirements for a targeted application

Note 1 to entry: Specified quality requirements may address aspects of quality such as focus, resolution, etc. Implicit quality requirements address the likelihood of achieving a correct comparison result.

**4.12 quality score**

quantitative expression of *quality* (4.11)



**4.13****quality score normalisation**

rescaling of *quality scores* (4.12) to improve consistency in scale and *interpretation* (4.8)

**4.14****quality score normalisation dataset****QSND**

dataset of biometric samples annotated with *quality scores* (4.12) for use in *quality score normalisation* (4.13)

Note 1 to entry: Target quality scores may be assigned on the basis of *performance* (4.10) outcomes using the sample in question, or may be based on quality factors recorded in acquisition of the dataset.

**4.15****quality score percentile rank****QSPR**

percentile rank of the *quality score* (4.12) of a biometric sample, derived from its own utility score and those of other samples in an identified control dataset

Note 1 to entry: See *QSND* (4.14).

**4.16****raw quality score**

*quality score* (4.12) that has not been interpreted, either by the creator or recipient of the score, and alone may not intrinsically provide contextual information

**4.17****source**

physical body part or function represented by a biometric sample

**4.18****utility**

observed *performance* (4.10) of a biometric sample or set of samples in one or more biometric systems

Note 1 to entry: The *character* (4.2) of the sample *source* (4.17) and the *fidelity* (4.6) of the processed samples contribute to, or similarly detract from, the utility of the sample.

Note 2 to entry: Utility may combine performance measures such as false match rate, false non-match rate, failure to enrol rate, and failure to acquire rate.

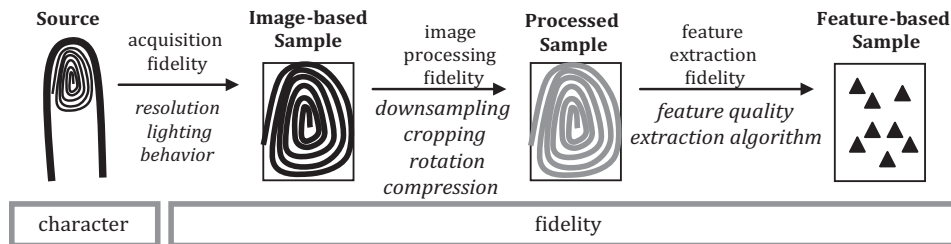
**5 Abbreviated terms**

BDB	biometric data block
BDIR	biometric data interchange record
BIR	biometric information record
CBEFF	common biometric exchange formats framework (ISO/IEC 19785)
FERET	facial recognition technology database
FNMR	false non-match rate
QAID	quality algorithm identification
QSND	quality score normalisation dataset
QSPR	quality score percentile rank
XML	eXtensible Markup Language

## 6 Biometric sample quality criteria

### 6.1 Reference model

In biometrics, the term “quality” is used to describe several different aspects of a biometric sample that contribute to the overall performance of a biometric system. For the purposes of standardization, this part of ISO/IEC 29794 defines terms, definitions, and a reference model for distinguishing between these different aspects of quality, illustrated in Figure 1. Figure 2 illustrates the relationship between character, fidelity, quality, utility, and system performance.



Quality = Function [character, fidelity components]  
 Utility reflects the impact of the quality of a single sample on system performance

Figure 1 — Quality reference model illustration

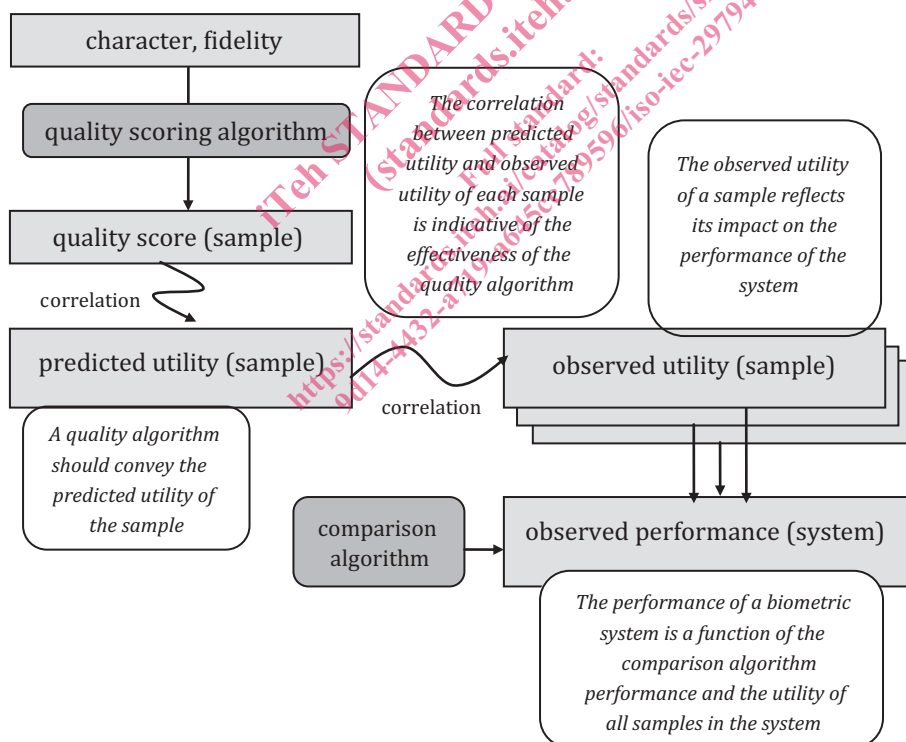


Figure 2 — Relationship between quality and system performance