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Information technology — On-card biometric comparison

Part 1
General principles and specifications

~~Technologies de l'information — Comparaison biométrique sur cartes — Partie 1: Principes généraux et spécifications~~

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*.

This first edition cancels and replaces ISO/IEC 24787:2018, which has been technically revised. ISO/IEC 24787 has been split into two parts: ISO/IEC 24787-1 and ISO/IEC 24787-2.

The main changes are as follows:

- Previous Clause 9 “Work-sharing on-card biometric comparison procedure” and other subclauses related to work-sharing have been moved to ISO/IEC 24787-2.

A list of all parts in the ISO/IEC 24787 series can be found on the ISO and IEC websites.

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Introduction

On-card biometric comparison provides a more secure biometric verification method than one where a biometric comparison is carried out outside a secure cryptographic device. Storing biometric reference data in a secure integrated circuit card (ICC) for on-card biometric comparison means that the reference is not available at any external interface once it has been stored in the ICC, mitigating the risk of extraction and misuse by an unauthorized party.

ISO/IEC 7816-11 and ISO/IEC 19785-3 cover technologies for off-card and simple on-card biometric comparison. The ISO/IEC 17839 series covers biometric system-on-card.

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Information technology — On-card biometric comparison

Part 1: General principles and specifications

1 Scope

This document provides requirements and general principles and specifications for a biometric comparison methodology suitable for the on-card environment.

This document establishes

- architectures of biometric comparison using an ICC,
- on-card biometric comparison, both in sensor-off-card systems and as part of biometric system-on-card, and
- security policies for on-card biometric comparison.

This document does not establish

- requirements for off-card biometric comparison,
- requirements for biometric system-on-card (defined in the ISO/IEC 17839 series),
- work-sharing on-card biometric comparison (defined in ISO/IEC 24787-2¹), or
- modality-specific requirements for storage and comparison.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2382-37:2022, *Information technology — Vocabulary — Part 37: Biometrics*

ISO/IEC 7816-4, *Identification cards — Integrated circuit cards — Part 4: Organization, security and commands for interchange*

ISO/IEC 7816-11:2022, *Identification cards — Integrated circuit cards — Part 11: Personal verification through biometric methods*

ISO/IEC 19785-3:2020, *Information technology — Common Biometric Exchange Formats Framework — Part 3: Patron format specifications*

ISO/IEC 19794 (all parts), *Information technology — Biometric data interchange formats*

¹ Under preparation. Stage at the time of publication: ISO/IEC FDIS 24787-2.

ISO/IEC 24761, Information technology — Security techniques — Authentication context for biometrics

ISO/IEC 29794 (all parts), Information technology — Biometric sample quality

ISO/IEC 39794 (all parts), Information technology — Extensible biometric data interchange formats

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 action

operation taken according to the results of the biometric decision (3.9)(3.9)

EXAMPLE In the case of on-card biometric comparison (3.11)(3.11), the action is a change in the security status.

Note 1 to entry: Specific details of possible actions based on the result of on-card biometric comparison within the [integrated circuit card \(ICC\)](#) are not within the scope of this document.

3.2 biometric auxiliary data

data that is dependent on the biometric modality and related to the biometric reference (3.6)(3.6) but does not include the biometric reference or a biometric sample

EXAMPLE Data such as orientation, scaling, etc.

3.3 biometric comparison parameters

application specific parameters that are required to perform a biometric comparison (3.11) with the appropriate enrolled biometric reference (3.6)(3.6)

3.4 biometric functionality information

capability information of on-card biometric comparison (3.11)(3.12) provided by the [integrated circuit card \(ICC\)](#) operating system

3.5 biometric information template

descriptive information regarding the associated biometric data

Note 1 to entry: "Biometric template" defined in ISO/IEC 2382-37 is not to be confused with the same as "biometric information template" (3.5) as defined in ISO/IEC 7816-11. A biometric template is a set of features extracted from the biometric samples during enrolment. This is completely different from the concept of "template" by the [integrated circuit card \(ICC\)](#) industry and standards (see ISO/IEC 7816-4), which is a defined structure of the value field of a constructed data object.

3.6

biometric reference

one or more stored biometric samples, biometric templates or biometric models attributed to a biometric data subject and used as the object of biometric comparison

[SOURCE: ISO/IEC 2382-37:2022, 37.03.16, modified — The EXAMPLE and Notes to entry have been removed.]

3.7

biometric system-on-card

card-sized device including biometric capture, data processing, storage, comparison, *decision* (3.9)(3.9) and *action* (3.1), used (3.1), to compose a complete *biometric verification* (3.8)(3.8) system

[SOURCE: ISO/IEC 17839-1:20XX2014, 3.1}, modified — Replaced "acquisition" with "capture", deleted "action", deleted Notes 1 and 2 to entry.]

3.8

biometric verification

process of confirming a biometric claim through comparison

Note 1 to entry: Biometric verification is performed through comparison, decision, and action.

[SOURCE: ISO/IEC 2382-37:2022, 37.08.03, modified — Notes 1 and 2 to entry have been replaced by a new Note 1 to entry.]

3.9

decision

process that compares a similarity score to a predefined threshold to decide whether the biometric claim is from the genuine cardholder or an imposter

3.10

image/signal processing

process that extracts distinctive biometric properties from a given image or signal

3.11

modality

~~same as combination of a biometric characteristic type, a sensor type and a processing method~~

Note 1 to entry: Adapted from the definition for the term "mode as defined" in ISO/IEC 2382-37:2022, 37.02.05.

3.12

on-card biometric comparison

comparison and decision making on the integrated circuit card (ICC) where the *biometric reference* (3.6)(3.6) is retained on-card in order to enhance security and privacy

3.13

off-card biometric comparison

biometric comparison performed outside the integrated circuit card (ICC) by the *biometric verification* (3.8)(3.8) system against the *biometric reference* (3.6)(3.6) stored on the ICC

3.14

work-sharing

splitting the computational workload of the comparison process between the integrated circuit card (ICC) and the interface device (IFD)

3.15

sensor-off-card

sensor located on the interface device (IFD) outside of the integrated circuit card (ICC)

3.16

termination

permanent deactivation of an on-card biometric comparison application

4 Abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO/IEC 7816-11, ISO/IEC 7816-4 and the following apply.

AID	application identifier
APDU	application protocol data unit
BER	basic encoding rules
BHT	biometric header template
BIDO	biometric information data object
CBEFF-3	common biometric exchange formats framework – Part 3 – patron format specifications (ISO/IEC 19785-3)
DF	dedicated file
DO	BER-TLV data object
EF	elementary file
<u>eMRTD</u>	<u>electronic machine-readable travel document</u>
FCI	file control information
FMR	false match rate
ICC	integrated circuit card
IFD	interface device
Len	length
MAC	message authentication code
<u>MF</u>	<u>master file</u>
OID	object identifier
PBO	PERFORM BIOMETRIC OPERATION
PIN	personal identification number
RFU	reserved for future use
SW1-SW2	status bytes

TLV tag length value
 Var variable

5 Conformance

An on-card biometric comparison system claiming conformance to this document shall follow the requirements below in Table 1:

Table 1 — Conformance requirement for on-card biometric comparison systems

No.	Description	Requirement
1	Conform to the requirements set forth in 8.3.18.3.1 for encoding of biometric data	Mandatory
2	Support the storage of three sets of data:	-
2a)	Biometric reference, as described in 8.3.28.3.2	Mandatory
2b)	Biometric functionality information, as described in 8.3.3.28.3.3.2	Mandatory unless implicitly known by IFD
2c)	Biometric comparison parameters, as described in 8.3.3.38.3.3.3	Mandatory unless implicitly known by IFD for the specific DF
3	Support the usage of one biometric reference by multiple applications, as described in 8.3.48.3.4	Optional
4	Support retry counter management, as described in 9.1.39.1.3	Mandatory
5	Conform to the requirements set forth in 8.48.4 and 8.58.5 for on-card biometric comparison implementations	Mandatory

6 Biometric data handling and encoding

Refer to 8.4 for the conformity of handling of biometric data with 8.4 specifies the requirements, according to ISO/IEC 7816-11.

Refer to 8.3.1 for the conformity of encoding of biometric data with 8.3.1 specifies the requirements, according to ISO/IEC 19785-3 and ISO/IEC 7816-11.

7 Architecture of biometric verification using an ICC

7.1 General

The following subclauses describe four biometric verification architectures using an ICC or an ICC with a biometric verification system. This document only specifies the requirements for the architecture mentioned in 7.3.7.3.

While off-card biometric comparison is out of scope for this document, the information in 7.27.2 is presented to enhance the understanding of the relationship between on-card biometric comparison methods covered in this document and off-card biometric comparison methods.

The biometric reference is stored in an ICC prior to the biometric verification execution.

Biometric verification can coexist with other authentication mechanisms, such as PIN, as defined in ISO/IEC 7816-4.

7.2 Off-card biometric comparison

Off-card biometric comparison means that the biometric verification is performed on the off-card biometric verification system outside of the ICC. The ICC acts as a storage device to store the biometric reference(s) of the cardholder. The process is schematically represented in [Figure 1-Figure 1](#).

The biometric verification system captures a biometric sample for comparison with a biometric reference retrieved from an ICC. The biometric verification system changes its security status based on the result of biometric comparison to perform subsequent transactions.

EXAMPLE In an automated border control system, a facial image (biometric reference) is stored in an electronic machine-readable travel document (eMRTD). An eMRTD is a passport with an embedded contactless IC as an ICC. When this eMRTD is presented to an automated border control system, mutual authentication is executed between the system and the eMRTD. Then the stored facial image (biometric reference) is retrieved from the eMRTD and facial image recognition (biometric comparison) is executed by the system. When the comparison is successful (the eMRTD holder is verified), the system allows the passage of the eMRTD holder.

