

---

---

**Information technology — Biometric data  
interchange formats —**

**Part 5:  
Face image data**

*Technologies de l'information — Formats d'échange de données  
biométriques —*

*Partie 5: Données d'image de la face*



**COPYRIGHT PROTECTED DOCUMENT**

© ISO/IEC 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

Foreword .....	v
Introduction.....	vi
1 Scope .....	1
2 Conformance .....	1
3 Normative references .....	2
4 Terms and definitions .....	2
5 The Face Image Data Record Format .....	4
5.1 Overview.....	4
5.2 Data Conventions .....	7
5.3 The General Header.....	8
5.4 The Representation Header.....	9
5.5 The Facial Information Block .....	11
5.6 The Landmark Point Block .....	16
5.7 The Image Information Block .....	22
5.8 The Representation Data block.....	25
5.9 The Image Data Block .....	25
5.10 The 3D Information Block.....	25
5.11 The 3D Data Block .....	32
6 The Basic Face Image Type .....	35
6.1 Inheritance requirements for the Basic Face Image Type .....	35
6.2 Image data encoding requirements for the Basic Face Image Type.....	35
6.3 Image data compression requirements for the Basic Face Image Type .....	35
6.4 Format requirements for the Basic Face Image Type .....	35
7 The Frontal Face Image Type .....	35
7.1 Inheritance requirements for the Frontal Face Image Type.....	35
7.2 Scene requirements for the Frontal Image Type.....	36
7.3 Photographic Requirements for the Frontal Image Type .....	37
7.4 Digital requirements for the Frontal Image Type .....	38
7.5 Format requirements for the Frontal Image Type .....	39
8 The Full Frontal Image Type.....	39
8.1 Inheritance requirements for the Full Frontal Face Image Type .....	39
8.2 Scene requirements for the Full Frontal Face Image Type .....	39
8.3 Photographic requirements for the Full Frontal Face Image Type .....	40
8.4 Digital requirements for the Full Frontal Face Image Type.....	42
8.5 Format requirements for the Full Frontal Image Type.....	42
9 The Token Face Image Type .....	42
9.1 Inheritance requirements for Token Face Image Type .....	42
9.2 Digital requirements for the Token Face Image Type.....	42
9.3 Format requirements for the Token Face Image Type .....	44
10 The Post-processed Frontal Face Image Type.....	44
10.1 Introduction.....	44
10.2 Inheritance requirements for the Post-processed Frontal Face Image Type.....	44
10.3 Format requirements for the Post-processed Frontal Face Image Type.....	44
11 The Basic 3D Image Type .....	45
11.1 Inheritance Requirements for the Basic 3D Image Type.....	45
11.2 The Basic 3D Image Type using the 3D Point Map representation .....	45

<b>11.3</b>	<b>The Basic 3D Image Type using the 3D Vertex representation .....</b>	<b>45</b>
<b>12</b>	<b>The Full Frontal 3D Image Type .....</b>	<b>45</b>
<b>12.1</b>	<b>Inheritance requirements .....</b>	<b>45</b>
<b>12.2</b>	<b>Coordinate System Type .....</b>	<b>46</b>
<b>12.3</b>	<b>Pose of the 3D representation .....</b>	<b>46</b>
<b>12.4</b>	<b>Calibration Texture Projection Accuracy .....</b>	<b>46</b>
<b>12.5</b>	<b>Requirements on Full Frontal 3D Image Types using the Range Image Representation .....</b>	<b>46</b>
<b>12.6</b>	<b>Requirements on Full Frontal 3D Image Types using the 3D Point Map Representation .....</b>	<b>47</b>
<b>12.7</b>	<b>Requirements on Full Frontal 3D Image Types using the 3D Vertex Representation .....</b>	<b>47</b>
<b>13</b>	<b>The Token Frontal 3D Image Type .....</b>	<b>47</b>
<b>13.1</b>	<b>Inheritance requirements .....</b>	<b>47</b>
<b>13.2</b>	<b>Requirements on Token Frontal 3D Image Types using the Range Image Representation .....</b>	<b>48</b>
<b>13.3</b>	<b>Requirements on Token Frontal 3D Image Types using the 3D Point Map Representation .....</b>	<b>48</b>
<b>13.4</b>	<b>Requirements on Token Frontal 3D Image Types using the Vertex Representation .....</b>	<b>48</b>
<b>14</b>	<b>Registered Format Type Identifier .....</b>	<b>48</b>
<b>Annex A</b>	<b>(normative) Conformance test methodology .....</b>	<b>49</b>
<b>Annex B</b>	<b>(informative) Best practices for Face Images .....</b>	<b>50</b>
<b>Annex C</b>	<b>(informative) Conditions for Taking Photographs .....</b>	<b>70</b>
<b>Annex D</b>	<b>(informative) Experimental studies .....</b>	<b>100</b>
<b>Annex E</b>	<b>(informative) The Frankfurt Horizon .....</b>	<b>110</b>
<b>Bibliography</b>	<b>.....</b>	<b>111</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.

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 shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 19794-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

This second edition constitutes a technical revision of the first edition (ISO/IEC 19794-5:2005), which is provisionally retained. It also incorporates the Amendments ISO/IEC 19794-5:2005/Amd.1:2007 and ISO/IEC 19794-5:2005/Amd.2:2009, and the Technical Corrigenda ISO/IEC 19794-5:2005/Cor.1:2008 and ISO/IEC 19794-5:2005/Cor.2:2008. This edition reflects the harmonization across the second generation of ISO/IEC 19794. Clause 5 contains descriptions of the harmonized general and representation headers; and Clauses 5 to 13 have been technically revised. Annexes C, D, and E have been added.

ISO/IEC 19794 consists of the following parts, under the general title *Information technology — Biometric data interchange formats*:

- *Part 1: Framework*
- *Part 2: Finger minutiae data*
- *Part 3: Finger pattern spectral 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*
- *Part 11: Signature/sign processed dynamic data*
- *Part 13: Voice data*
- *Part 14: DNA data*

## Introduction

Face images, also commonly referred to as displayed portraits, have been used for many decades to verify the identity of persons. In recent years, digital face images are used in many applications including human examination as well as computer automated face recognition. Although photographic formats have been standardized in some cases such as for passports and driver licenses, there is a need to define a standard data format of digital face images to allow interoperability among vendors.

This part of ISO/IEC 19794 is intended to provide a face image format for face recognition applications requiring exchange of face image data. The typical applications are

- 1) human examination of facial images with sufficient resolution to allow a human examiner to ascertain small features such as moles and scars that might be used to verify identity,
- 2) human verification of identity by comparison of persons against facial images,
- 3) computer automated face biometric identification (one-to-many searching), and
- 4) computer automated face biometric verification (one-to-one comparison).

To enable many applications on a variety of devices, including devices that have limited resources available for data storage, and to improve face recognition accuracy, this part of ISO/IEC 19794 specifies not only a data format, but also scene constraints (lighting, pose, expression, etc.), photographic properties (positioning, camera focus, etc.) and digital image attributes (image resolution, image size, etc.).

Several face image types are introduced to define categories that satisfy requirements of some applications:










- **Basic:** This is the fundamental Face Image Type that specifies a record format including header and representation data. All Face Image Types adhere to the properties of this type. No mandatory scene, photographic and digital requirements are specified for this image type.
- **Frontal:** A Basic Face Image Type that adheres to additional requirements appropriate for frontal face recognition and/or human examination. Two types of Frontal Face Image Types are defined in this part of ISO/IEC 19794, Full Frontal and Token Frontal (or simply Token).
- **Full Frontal:** A Face Image Type that specifies frontal images with sufficient resolution for human examination as well as reliable computer face recognition. This type of Face Image Type includes the full head with all hair in most cases, as well as neck and shoulders. This image type is suitable for permanent storage of the face information, and it is applicable to portraits for passport, driver license, and “mugshot” images.
- **Token Frontal:** A Face Image Type that specifies frontal images with a specific geometric size and eye positioning based on the width and height of the image. This image type is suitable for minimizing the storage requirements for computer face recognition tasks such as verification while still offering vendor independence and human verification (versus human examination which requires more detail) capabilities.
- **Post-processed Frontal:** Applying digital post-processing to a captured image can modify this image in a way that it is more suitable for automatic face recognition. The Post-processed Frontal Face Image Type is thought of as the interchange format for these kinds of facial images.
- **Basic 3D:** The Basic 3D Image Type is the base Image Type of all 3D Face Image Types. All 3D Face Image Types obey normative requirements of this image type.
- **Full Frontal 3D:** The Full Frontal 3D Image Type combines a Full Frontal 2D image with additional 3D information.
- **Token Frontal 3D:** The Token Frontal 3D Image Type combines a Token Frontal 2D image with additional 3D information.

Table 1 shows the relationships between Face Image Types using the notion of inheritance. For example, Frontal inherits properties from Basic, which means that all normative clauses that apply to Basic also apply to Frontal.

**Table 1 — Inheritance of Face Image Types**

Face Image Type	Inherits from	Normative clauses	Informative annexes
Basic	None	1, 2, 3, 4, 5, 6	B.1
Frontal	Basic	7	B.2
Full Frontal	Frontal	8	B.3
Token Frontal	Frontal	9	B.4
Post-processed Frontal	Frontal	10	

Figure 1 gives a general overview of the scene, photographic, digitization, and format requirements for the face image types specified in this part of ISO/IEC 19794.

Requirements			
Scene	Photographic	Digital	Format
 Lighting	 Positioning	 Digital Camera	 Digital Specifications
 Image and Subject	 Camera Attributes	 Analogue to Digital	 Record Format and Organization
 Image Scanning			
<i>Clauses:</i> Basic Face                      None	<i>Clauses:</i> Basic Face                      None	<i>Clauses:</i> Basic Face                      None	<i>Clauses:</i> Basic Face                      5 6.2 6.3 6.4
Frontal Face                      7.2 Full Frontal Face                8.2	Frontal Face                      7.3 Full Frontal Face                8.3	Frontal Face                      7.4 Full Frontal Face                8.4 Token Face                        9.2	Frontal Face                      7.5 Full Frontal Face                8.5 Token Face                        9.3 Post-processed Frontal Face    10.3

**Figure 1 — The types of imaging requirements specified in this part of ISO/IEC 19794. The Basic Face Image Type has no scene, photographic, or digital requirements**

This is a revision of ISO/IEC 19794-5:2005. The structure of the data format is not compatible with the previous version.

NOTE This part of ISO/IEC 19794 relies on other ISO International Standards.



# Information technology — Biometric data interchange formats —

## Part 5: Face image data

### 1 Scope

This part of ISO/IEC 19794

- specifies a record format for storing, recording, and transmitting the information from one or more facial images or a short video stream of facial images,
- specifies scene constraints of the facial images,
- specifies photographic properties of the facial images,
- specifies digital image attributes of the facial images,
- provides best practices for the photography of faces.

### 2 Conformance

A biometric data record conforms to this part of ISO/IEC 19794 if it satisfies all of the normative requirements related to:

A) Its data structure, data values and the relationships between its data elements, as specified in Clauses 5, 6, 7, 8 for the Full Frontal Face Image Type, Clauses 5, 6, 7, 9 for the Token Frontal Image Type, and Clauses 5, 6, 7, 10 for the Post-processed Frontal Image Type of this part of ISO/IEC 19794, respectively.

B) The relationship between its data values and the input biometric data from which the biometric data record was generated, as specified in Clauses 5, 6, 7, 8 for the Full Frontal Face Image Type, Clauses 5, 6, 7, 9 for the Token Frontal Image Type, and Clauses 5, 6, 7, 10 for the Post-processed Frontal Image Type of this part of ISO/IEC 19794, respectively.

A system that produces biometric data records is conformant to this part of ISO/IEC 19794 if all biometric data records that it outputs conform to this part of ISO/IEC 19794 (as defined above) as claimed in the Implementation Conformance Statement associated with that system. A system does not need to be capable of producing biometric data records that cover all possible aspects of this part of ISO/IEC 19794, but only those that are claimed to be supported by the system in the Implementation Conformance Statement.

A system that uses biometric data records is conformant to this part of ISO/IEC 19794 if it can read, and use for the purpose intended by that system, all biometric data records that conform to this part of ISO/IEC 19794 (as defined above) as claimed in the Implementation Conformance Statement associated with that system. A system does not need to be capable of using biometric data records that cover all possible aspects of this part of ISO/IEC 19794, but only those that are claimed to be supported by the system in an Implementation Conformance Statement.

### 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 10918-1, *Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines*

ISO/IEC 14496-2:2004, *Information technology — Coding of audio-visual objects — Part 2: Visual*

ISO/IEC 15444-1, *Information technology — JPEG 2000 image coding system: Core coding system*

ISO/IEC 15948, *Information technology — Computer graphics and image processing — Portable Network Graphics (PNG): Functional specification*

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

ISO/IEC 29794-1, *Information technology — Biometric sample quality — Part 1: Framework*