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Information technology — Transition examples from the ISO/IEC 19794:2005 series to the ISO/IEC 39794 series for ID documents

Technologies de l'information — Exemples de passage de la série ISO/IEC 19794:2005 à la série ISO/IEC 39794 pour les documents d'identité

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Foreword

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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 or www.iec.ch/members_experts/refdocs).

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This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Face images, fingerprints and iris patterns have been used for many decades to verify the identity of individuals. In recent years, digital face images have been used in many applications of automated face recognition. Photographic formats are standardized, for example for electronic machine-readable travel documents (eMRTDs), identity documents and driver's licences.

Biometric data interchange formats enable the interoperability of different biometric systems. The first generation of biometric data interchange formats was published in 2005 with the first edition of the ISO/IEC 19794 series. From 2011 onwards, the second generation of biometric data interchange formats was published, in which new data elements related to biometric sample quality were added and header data structures were harmonized across all parts of the ISO/IEC 19794 series, along with XML (Extensible Markup Language) encoding.

To meet new and emerging market demands and to avoid future compatibility issues, ISO/IEC JTC 1/SC 37 developed the ISO/IEC 39794 series. This was the third generation of biometric data interchange formats, defining extensible biometric data interchange formats capable of including future extensions in a structured manner. Extensible specifications in ASN.1 (Abstract Syntax Notation One) and the Distinguished Encoding Rules of ASN.1 form the basis for encoding biometric data in binary tag-length-value formats. XML Schema Definitions form the basis for encoding biometric data in XML.

The extended and new data formats documented in the ISO/IEC 39794 series specify application-specific profiles. The structure of the data format in this series is not backward compatible with the previous generations. However, this new generation addresses, for the first time, a mechanism for maintaining future extensions in a backwards and forwards compatible manner.

This document, ISO/IEC TR 49794, is intended to assist organizations in moving from the first edition of the ISO/IEC 19794 series (2005) to the current edition of the ISO/IEC 39794 series (2019) for ID documents by providing transition examples.

Information technology — Transition examples from the ISO/IEC 19794:2005 series to the ISO/IEC 39794 series for ID documents

1 Scope

This document provides transition examples from ISO/IEC 19794-4:2005 and ISO/IEC 19794-5:2005 formats to ISO/IEC 39794-4:2019 and ISO/IEC 39794-5:2019 formats for eMRTD application. This document also provides an implementation example for the ISO/IEC 39794-6:2021 format.

This document includes:

— information for eMRTD issuers and eMRTD-reader vendors;

— summarized tables of data elements of ISO/IEC 19794-4:2005 and ISO/IEC 19794-5:2005 and ISO/IEC 39794-4:2019, ISO/IEC 39794-5:2019 and ISO/IEC 39794-6:2021;

— correspondence tables of data elements between ISO/IEC 19794-4:2005 and ISO/IEC 19794-5:2005 and ISO/IEC 39794-4:2019 and ISO/IEC 39794-5:2019, providing:

  — information on whether each data element is normative or optional, and

  — a brief note of each data element from the viewpoint of transition;

— tag, length, value (TLV) data examples of ISO/IEC 39794-4:2019, ISO/IEC 39794-5:2019 and ISO/IEC 39794-6:2021 for implementation, and,

— tag lists of ISO/IEC 39794-4:2019, ISO/IEC 39794-5:2019 and ISO/IEC 39794-6:2021, and an extended example of ISO/IEC 39794-5 as informative annexes.

The following are not within the scope of this document:

— second and later editions of the ISO/IEC 19794 series (2011 and after), and,

— ASN.1 formats and XML formats specified in the ISO/IEC 39794 series.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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/

4 Symbols and abbreviated terms

BDB	biometric data block
BHT	biometric header template
CBEFF	Common Biometric Exchange Format Framework
DER	distinguished encoding rules
DG	data group
DO	ber-tlv data object
eMRTD	electronic machine-readable travel document
LDS	logical data structure
PID	product identifier
TLV	tag, length, value

5 Transition of biometric data groups defined in Doc 9303-10

5.1 Data groups for biometric data defined in Doc 9303-10

Doc 9303-10 specifies the LDS of eMRTDs. This includes DG 2 for face (mandatory), DG 3 for fingerprint (optional) and DG 4 for iris (optional). Each DG contains biometric data encoded in accordance with the relevant International Standards in order to maintain international interoperability.

DG 2 is TLV encoding and its tag is shown in Table 1 (see also Doc 9303-10:2021, Table 43). A Biometric Information Template Group Template is DO '7F61' as shown in Table 2, which is located under DO '75' (see Doc 9303-10:2021, Table 44). DO '88' (light grey-highlighted) in Table 2 is a format type; the number assigned respectively to the biometric data formats is stored in it. DO '5F2E' or DO '7F2E' (dark grey-highlighted) contain biometric data. If this biometric data is plain binary data, as in ISO/IEC 19794-5:2005 encoding, DO '5F2E' is chosen. If it is a constructed DO, as in ISO/IEC 39794-5 encoding, DO '7F2E' is chosen.

Table 1 — Data group 2 — Tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 43)

Tag	L	Value
75	Var	See encoding of EF.DG2 (Table 2)

Table 2 — Data group 2 — Biometric encoding tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 44)

Tag	L	Value				
7F61	Var	**Biometric information template group template**				
		Tag	**L**	**Value**		
		02	01	Integer — Number of instances of this type of biometric		
		7F60	Var	1st Biometric information template		
			Tag	**L**	**Value**	
			A1	Var	Biometric header template (BHT)	
				Tag	**L**	**Value**
NOTE In case of '5F2E', the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.						

Table 2 *(continued)*

				80	02	ICAO header version 0101 (Optional) – Version of the CBEFF patron header format
				81	01-03	Biometric type (Optional)
				82	01	Biometric subtype (Optional for DG2)
				83	07	Creation date and time (Optional)
				85	08	Validity period (from through) (Optional)
				86	04	Creator of the biometric reference data (PID) (Optional)
				87	02	Format owner (REQUIRED)
				88	02	Format type (REQUIRED)
			5F2E or 7F2E	Var	Biometric data (encoded according to format owner) also called the biometric data block (BDB)	
NOTE In case of '5F2E', the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.						

DG 3 has the same structure as DG 2 and its details are shown in Table 3 (see Doc 9303-10:2021, Table 46) and Table 4 (see Doc 9303-10:2021, Table 47). The roles of DO '88' and DO '5F2E' / DO '7F2E' are identical to those of DG 2.

Table 3 — Data group 3 — Tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 46)

Tag	L	Value
63	Var	See encoding of EF.DG3 (Table 4)

Table 4 — Data group 3 — Biometric encoding tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 47)

Tag	L	Value				
7F61	Var	Biometric information template group template				
		Tag	L	Value		
		02	01	Integer – Number of instances of this type of biometric		
		7F60	Var	1st Biometric information template		
			Tag	L	Value	
			A1	Var	Biometric header template (BHT)	
				Tag	L	Value
				80	02	ICAO header version 0101 (Optional) – Version of the CBEFF patron header format
				81	01-03	Biometric type (Optional)
				82	01	Biometric subtype (REQUIRED for DG 3)
				83	07	Creation date and time (Optional)
				85	08	Validity period (from through) (Optional)
				86	04	Creator of the biometric reference data (PID) (Optional)
				87	02	Format owner (REQUIRED)
				88	02	Format type (REQUIRED)
			5F2E or 7F2E	Var	Biometric data (encoded according to format owner) also called the biometric data block (BDB)	
		Tag	L	Value		
NOTE In case of '5F2E' the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.						

Table 4 *(continued)*

		7F60	Var	2nd Biometric information template		
			Tag	**L**	**Value**	
			A1	Var	Biometric header template (BHT)	
				Tag	**L**	**Value**
				80	02	ICAO header version 0101 (Optional) – Version of the CBEFF patron header format
				81	01-03	Biometric type (Optional)
				82	01	Biometric subtype (REQUIRED for DG 3)
				83	07	Creation date and time (Optional)
				85	08	Validity period (from through) (Optional)
				86	04	Creator of the biometric reference data (PID) (Optional)
				87	02	Format owner (REQUIRED)
				88	02	Format type (REQUIRED)
			5F2E or 7F2E	Var	Biometric data (encoded according to format owner) also called the biometric data block (BDB)	
NOTE In case of '5F2E' the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.						

DG 4 also has the same structure as DG 2 and its details are shown in Table 5 (see Doc 9303-10:2021, Table 53) and Table 6 (see Doc 9303-10:2021, Table 54). The roles of DO '88' and DO '5F2E' / DO '7F2E' are identical to those of DG 2.

Table 5 — Data group 4 — Tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 53)

Tag	L	Value
76	Var	See Biometric encoding of EF.DG4 (Table 6)

Table 6 — Data group 4 — Biometric encoding tags of logical data structure (SOURCE: Doc 9303-10:2021, Table 54)

Tag	L	Value			
7F61	Var	Biometric information template group template			
		Tag	**L**	**Value**	
		02	01	Integer — Number of instances of this type of biometric	
		7F60	Var	1st Biometric information template	
			Tag	**L**	**Value**
			A1	Var	Biometric header template (BHT)
				Tag	**L**	**Value**
				80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format
				81	01-03	Biometric type (Optional)
				82	01	Biometric subtype (REQUIRED for DG 4)
				83	07	Creation date and time (Optional)
				85	08	Validity period (from through) (Optional)
				86	04	Creator of the biometric reference data (PID) (Optional)
				87	02	Format owner (REQUIRED)
NOTE In case of '5F2E' the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.						

Table 6 *(continued)*

				88	02	Format type (REQUIRED)
			5F2E or 7F2E	Var	Biometric data (encoded according to format owner) also called the biometric data block (BDB)	
		Tag	**L**	**Value**		
		7F60	Var	2nd Biometric information template		
			Tag	**L**	**Value**	
			A1	Var	Biometric header template (BHT)	
				Tag	**L**	**Value**
				80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format
				81	01-03	Biometric type (Optional)
				82	01	Biometric subtype (REQUIRED for DG 4)
				83	07	Creation date and time (Optional)
				85	08	Validity period (from through) (Optional)
				86	04	Creator of the biometric reference data (PID) (Optional)
				87	02	Format owner (REQUIRED)
				88	02	Format type (REQUIRED)
			5F2E or 7F2E	Var	Biometric data (encoded according to format owner) also called the biometric data block (BDB)	

NOTE In case of '5F2E' the biometric data block is encoded according to the format owner and format type. In case of '7F2E', the biometric data template is defined in ISO/IEC 7816-11.

5.2 Data groups for biometric data using the ISO/IEC 39794 series

eMRTD issuers essentially maintain the data structures as shown in Table 7, Table 10 and Table 12.

DG 2 is shown in Table 7. DO '88' (light grey-highlighted) in Table 7 is the identifier of format type, which indicates ISO/IEC 39794-5:2019 instead of ISO/IEC 19794-5:2005 (see Table 8).

Table 7 — Data group 2 — Biometric encoding tags of logical data structure for ISO/IEC 39794-5:2019

Tag	**L**	**Value**							**Notes**
7F61	Var.	Biometric information template group template							
		Tag	**L**	**Value**					
		02	01	Integer — Number of instances of this type of biometric					
		7F60	Var.	1st Biometric information template					
				Tag	**L**	**Value**			
				A1	Var.	Biometric header template (BHT)			
						Tag	**L**	**Value**	
						80	02	ICAO header version 0101 (Optional) – Version of the CBEFF patron header format	
						81	01-03	Biometric type (Optional)	
						82	01	Biometric subtype (Optional for DG 2)	

Table 7 *(continued)*

						83	07	Creation date and time (Optional)	
						85	08	Validity period (from through) (Optional)	
						86	04	Creator of the biometric reference data (PID) (Optional)	
						87	02	Format owner (REQUIRED)	'0101' is stored, which is the ID of ISO/IEC JTC 1/SC 37
						88	02	Format type (REQUIRED)	'002A' is stored when ISO/IEC 39794-5:2019 is used. See Table 8.
				Tag	**L**	**Value**			
				7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.			'7F2E' is used when ISO/IEC 39794-5:2019 is contained under it. See Table 9.

Table 8 — CBEFF BDB format types for face image data

Data group	Modality	International Standard No.	Format type	
			Hex	Decimal
DG 2	Face	ISO/IEC 19794-5:2005	0x0008	8
		ISO/IEC 39794-5:2019	0x002A	42

Biometric data encoded according to the ISO/IEC 19794 series (2005 edition) is stored in DO '5F2E'. Biometric data encoded according to the ISO/IEC 39794 series is constructed, so eMRTD issuers use DO '7F2E' instead of DO '5F2E' (see Table 9).

Table 9 — Tag number for storing biometric data in biometric information template

Tag	International Standard No.
5F2E	ISO/IEC 19794 series (2005 edition)
7F2E	ISO/IEC 39794 series

DG 3 is shown in Table 10. DO '88' (light grey high-lighted) in Table 10 is the identifier of format type, which indicates ISO/IEC 39794-4 instead of ISO/IEC 19794-4:2005 (see Table 11).

Table 10 — Data group 3 — Biometric encoding tags of logical data structure for ISO/IEC 39794-4:2019

Tag	L	Value							Notes
7F61	Var.	Biometric information template group template							
		Tag	**L**	**Value**					
		02	01	Integer — Number of instances of this type of biometric					
		7F60	Var.	1st Biometric information template					
				Tag	**L**	**Value**			
				A1	Var.	Biometric header template (BHT)			
						Tag	**L**	**Value**	

Table 10 *(continued)*

						80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format	
						81	01-03	Biometric type (Optional)	
						82	01	Biometric subtype (REQUIRED for DG 3)	
						83	07	Creation date and time (Optional)	
						85	08	Validity period (from through) (Optional)	
						86	04	Creator of the biometric reference data (PID) (Optional)	
						87	02	Format owner (REQUIRED)	'0101' is stored, which is the ID of ISO/IEC JTC 1/SC 37
						88	02	Format type (REQUIRED)	'0028' is stored when ISO/IEC 39794-4:2019 is used. See Table 11.
				Tag	**L**	**Value**			
				7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.			'7F2E' is used when ISO/IEC 39794-4:2019 is contained under it. See Table 9.
		Tag	**L**	**Value**					
		7F60	Var.	2nd Biometric information template					
				Tag	**L**	**Value**			
				A1	Var.	Biometric header template (BHT)			
						Tag	**L**	**Value**	
						80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format	
						81	01-03	Biometric type (Optional)	
						82	01	Biometric subtype (REQUIRED for DG 3)	
						83	07	Creation date and time (Optional)	
						85	08	Validity period (from through) (Optional)	
						86	04	Creator of the biometric reference data (PID) (Optional)	
						87	02	Format owner (REQUIRED)	'0101' is stored, which is the ID of ISO/IEC JTC 1/SC 37
						88	02	Format type (REQUIRED)	'0028' is stored when ISO/IEC 39794-4:2019 is used. See Table 11.
				Tag	**L**	**Value**			

Table 10 *(continued)*

				7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.	'7F2E' is used when ISO/IEC 39794-4:2019 is contained under it. See Table 9.

Table 11 — CBEFF BDB format types for fingerprint image data

Data group	Modality	International Standard No.	Format type	
			Hex	Decimal
DG 3	Fingerprint	ISO/IEC 19794-4:2005	0x0007	7
		ISO/IEC 39794-4:2019	0x0028	40

DG 4 is shown in Table 12. DO '88' (light grey highlighted) in Table 12 is the identifier of format type, which indicates ISO/IEC 39794-6 instead of ISO/IEC 19794-6:2005 (see Table 13).

Table 12 — Data group 4 — Biometric encoding tags of logical data structure for ISO/IEC 39794-6:2021

Tag	L	Value							Notes
7F61	Var.	Biometric information template group template							
		Tag	**L**	**Value**					
		02	01	Integer — Number of instances of this type of biometric					
		7F60	Var.	1st Biometric information template					
				Tag	**L**				
				A1	Var.	Biometric header template (BHT)			
						Tag	**L**	**Value**	
						80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format	
						81	01-03	Biometric type (Optional)	
						82	01	Biometric subtype (REQUIRED for DG 4)	
						83	07	Creation date and time (Optional)	
						85	08	Validity period (from through) (Optional)	
						86	04	Creator of the biometric reference data (PID) (Optional)	
						87	02	Format owner (REQUIRED)	'0101' is stored, which is the ID of ISO/IEC JTC 1/SC 37
						88	02	Format type (REQUIRED)	'002C' is stored when ISO/IEC 39794-6:2021 is used. See Table 13.
				Tag	**L**	**Value**			
				7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.			'7F2E' is used when ISO/IEC 39794-6:2021 is contained under it. See Table 9.

Table 12 *(continued)*

		Tag	L	Value					
		7F60	Var.	2nd Biometric information template					
				Tag	**L**	**Value**			
				A1	Var.	Biometric header template (BHT)			
						Tag	**L**	**Value**	
						80	02	ICAO header version 0101 (Optional) — Version of the CBEFF patron header format	
						81	01-03	Biometric type (Optional)	
						82	01	Biometric subtype (REQUIRED for DG 4)	
						83	07	Creation date and time (Optional)	
						85	08	Validity period (from through) (Optional)	
						86	04	Creator of the biometric reference data (PID) (Optional)	
						87	02	Format owner (REQUIRED)	'0101' is stored, which is ID of ISO/IEC JTC 1/SC 37
						88	02	Format type (REQUIRED)	'002C' is stored when ISO/IEC 39794-6:2021 is used. See Table 13.
				Tag	**L**	**Value**			
				7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.			'7F2E' is used when ISO/IEC 39794-6:2021 is contained under it. See Table 9.

Table 13 — CBEFF BDB format types for iris image data

Data group	Modality	International Standard No.	Format type		Notes
			Hex	Decimal	
DG 4	Iris	ISO/IEC 19794-6:2005	0x0009	9	Rectilinear coordinates
			0x000B	11	Polar coordinates
		ISO/IEC 39794-6:2021	0x002C	44	

ISO/IEC JTC 1/SC 17 is responsible for the biometric data template DO '7F2E', whereas the tag allocation authority of ISO/IEC 39794-4, ISO/IEC 39794-5 and ISO/IEC 39794-6 is ISO/IEC JTC 1/SC 37. For DOs that are nested into a biometric information template DO '7F60' and whose tag is not allocated by ISO/IEC JTC 1/SC 17, the tag allocation authority is ISO/IEC JTC 1/SC 37, because eMRTD implementation assigns ISO/IEC JTC 1/SC 37 as default tag allocation authority.

The ASN.1 module in Annex A describes the syntax of the biometric data template (DO '7F2E') in the LDS of eMRTDs, based on ISO/IEC 7816-11. The biometric data template is encoded by applying the ASN.1 distinguished encoding rules (DERs) defined in ISO/IEC 8825-1. Table 14 shows the resulting encoding.

DO '7F2E' contains biometric data encoded in ISO/IEC 39794-4, ISO/IEC 39794-5 and ISO/IEC 39794-6, of which the top tag numbers are shown in Table 15. Examples of detailed data elements are described

in Clauses 6, 7, and 8. Tag lists automatically generated from ASN.1 definitions of ISO/IEC 39794-4, ISO/IEC 39794-5 and ISO/IEC 39794-6 are shown in Annex B, C and D.

Table 14 — Data structure under DO '7F2E' for the ISO/IEC 39794 series

Tag	L	Value				
7F2E	Var.	Biometric data template defined in ISO/IEC 7816-11.				
		Tag	L	Value		
		A1	Var.	Biometric data in standardized format (Constructed)		
				Tag	L	Value
				64, 65 or 66	Var	DO defined in the ISO/IEC 39794 series. See Table 15.

Table 15 — Top tag numbers of DOs encoded in the ISO/IEC 39794 series

International Standard No.	Tag
ISO/IEC 39794-4	64
ISO/IEC 39794-5	65
ISO/IEC 39794-6	66

5.3 Internal consistency checking of the data groups for biometric data

eMRTD readers can discriminate which International Standard was applied to encode a presented eMRTD: one from the ISO/IEC 19794 series (2005) or the ISO/IEC 39794 series. They can also check consistency among data elements. The following points can be considered when discriminating and checking:

— The value of DO '88' can be used to identify which International Standard has been applied. See Table 8 for DG 2, Table 11 for DG 3, and Table 13 for DG 4.

EXAMPLE 1 If 0x0008 is read in DG 2, ISO/IEC 19794-5:2005 encoded data would be found. If 0x002A is read in DG 2 , ISO/IEC 39794-5:2019 would be found.

— The value of DO '88' can be used to check consistency of the tag numbers for storing biometric data in the biometric information template:

  — The top tag number for storing biometric data depends on either the ISO/IEC 19794 series (2005) or the ISO/IEC 39794 series. See Table 9.

  EXAMPLE 2 If DO '5F2E' is read in DG 2, ISO/IEC 19794-5:2005 encoded data would be found under it. If DO '7F2E' is read in DG 2, ISO/IEC 39794-5:2019 would be found.

  — The tag number of biometric data under DO '7F2E' depends on which part of the ISO/IEC 39794 series is used. See Table 14 and Table 15.

  EXAMPLE 3 If 0x002A is read in DO '88' of DG 2, and 0x65 is read as the tag number under DO 'A1', then this is consistent.

6 Transition of face image data

6.1 Data elements of face image data

6.1.1 Data elements specified in ISO/IEC 19794-5:2005

Table 16 shows data elements specified in ISO/IEC 19794-5:2005. Note that several mandatory elements allow "unspecified" values. If eMRTD issuers set "unspecified" values in these elements, they can omit such elements from biometric data encoded ISO/IEC 39794-5:2019 when transitioning.

Table 16 — Data elements specified in ISO/IEC 19794-5:2005

	Block name	Data element name	M / O	Clause No. of ISO/IEC 19794-5:2005	Notes
1	Facial record header	Format identifier	M	5.4.1	
2		Version number	M	5.4.2	
3		Length of record	M	5.4.3	
4		Number of facial images	M	5.4.4	This defines the number of "facial record data" that consists of "facial information block", "feature point block" (if it exists), "image information block", and "image data block".
5	Facial information block	Facial record data length	M	5.5.1	
6		Number of feature points	M	5.5.2	If zero is set, there is no "feature point block".
7		Gender	M	5.5.3	If zero is set, this indicates "unspecified".
8		Eye colour	M	5.5.4	
9		Hair colour	M	5.5.5	
10		Property mask	M	5.5.6	
11		Expression	M	5.5.7	
12		Pose angle	M	5.5.8	If "181" is set, this indicates "unspecified".
13		Pose angle uncertainty	M	5.5.9	If zero is set, this indicates "unspecified".
14	Feature point block	Feature point type	O	5.6.1	The number of feature point blocks is equal to the "number of feature points" element. If this number is zero, no feature point block exists.
15		Feature point code	O	5.6.2	
16		Horizontal and vertical position	O	5.6.2	
17		Reserved	O	—	
18	Image information block	Face image type	M	5.7.1	
19		Image data type	M	5.7.2	
20		Width	M	5.7.3	
21		Height	M	5.7.4	
22		Image colour space	M	5.7.5	If zero is set, it indicates "unspecified".
23		Source type	M	5.7.6	
24		Device type	M	5.7.7	
25		Quality	M	5.7.8	
26	Image data block	Data structure	M	5.8.1	

NOTE "M / O" means mandatory / optional.

6.1.2 Data elements specified in ISO/IEC 39794-5:2019

Table 17 shows data elements specified in ISO/IEC 39794-5:2019. Each data element has its own tag number that can be found in Annex B.

Table 17 — Data elements specified in ISO/IEC 39794-5:2019

	Block / Element name	M / O	Clause No. of ISO/ IEC 39794-5:2019	Clause No. of ISO/ IEC 39794-1:2019	Notes
1	Face image data block	M	7.2	—	
2	Version block	M	7.3	8.2	This block is under "Face image data block" (No. 1). This block is a sequence of two integers: one is the generation of biometric data and the other is the year of the International Standard publication. In the case of ISO/IEC 39794-5:2019, the generation is "3" (0x3) and the year is "2019" (0x7E3).
3	Representation block	M	7.4	—	This block is under "Face image data block" (No. 1). Multiple representation blocks can exist.
4	Representation identifier	M	7.5	—	This DO is under "Representation block" (No. 3). The non-negative unique number is assigned on each representation block. For example, the first identifier is "0" (0x0) followed by increments of one.
5	Capture date/time block	O	7.6	8.3.2	This block is under "Representation block" (No. 3).
6	Quality blocks	O	7.7	8.3.3	This block is under "Representation block" (No. 3) This is expanded from ISO/IEC 19794-5:2005 and can contain multiple qualities generated by multiple quality evaluation algorithms respectively.
7	PAD data block	O	7.8	8.3.4	This block is under "Representation block" (No. 3) This is newly added for presentation attack detection.
8	Session identifier	O	7.9	—	These DOs are under "PAD data block" (No. 7).
9	Derived from	O	7.10	—	
10	Capture device block	O	7.11	8.3.1	
11	Model identifier block	O	7.12	8.3.1.1	These DOs are under "Capture device block" (No. 10).
12	Certification identifier blocks	O	7.13	8.3.1.3	
13	Identity metadata block	O	7.14	—	This DO is under "Representation block" (No. 3).

NOTE 1 "M / O" means mandatory / optional.

NOTE 2 3D shape representation block, specified in ISO/IEC 39794-5:2019, is not shown in this table.

Table 17 *(continued)*

	Block / Element name	M / O	Clause No. of ISO/ IEC 39794-5:2019	Clause No. of ISO/ IEC 39794-1:2019	Notes
14	Gender	O	7.15	—	These DOs are under "Identity metadata block" (No. 13).
15	Eye colour	O	7.16	—	
16	Hair colour	O	7.17	—	
17	Subject height	O	7.18	—	
18	Properties block	O	7.19	—	This DO is under "Identity metadata block" (No. 13). "Blink" and "Feature distorting medical condition" in ISO/IEC 19794-5:2005 are changed to "pupil or iris not visible" and "biometric absent" respectively in ISO/ IEC 39794-5:2019.
19	Expression block	O	7.20	—	These DOs are under "Identity metadata block" (No. 13).
20	Pose angle block	O	7.21	—	
21	Yaw/pitch/roll angle data block	O	7.22	—	These DOs are under "Pose angle block" (No. 20).
22	Yaw/pitch/roll angle value	O	7.23	—	These DOs are under "Yaw/pitch/roll angle data blocks" (No. 21) respectively.
23	Yaw/pitch/roll angle uncertainty	O	7.24	—	
24	Landmark block	O	7.25	—	This block is under "Representation block" (No. 3).
25	Image representation block	M	7.30	—	This block is under "Representation block" (No. 3).
26	2D image representation block	M	7.31	—	This block is under "Image representation block" (No. 25). If 2D image representation is chosen, this element is mandatory. See NOTE 2 at the end of this table.
27	2D representation data	M	7.32	—	These DOs are under "2D image representation block" (No. 26).
28	2D capture device block	O	7.33	—	
29	2D capture device spectral block	O	7.34	—	This block is under "2D capture device block" (No. 28).
30	2D capture device technology identifier	O	7.35	—	This DO is under "2D capture device block" (No. 28).
31	2D image information block	M	7.36	—	This block is under "2D image representation block" (No. 26).
32	2D face image kind	O	7.37	—	This DO is under "2D image information block" (No. 31).
33	Post-acquisition processing block	O	7.38	—	This block is under "2D image information block" (No. 31).

NOTE 1 "M / O" means mandatory / optional.

NOTE 2 3D shape representation block, specified in ISO/IEC 39794-5:2019, is not shown in this table.

Table 17 *(continued)*

	Block / Element name	M / O	Clause No. of ISO/ IEC 39794-5:2019	Clause No. of ISO/ IEC 39794-1:2019	Notes
34	Lossy transformation attempts	O	7.39	—	These DOs is under "2D image information block" (No. 31).
35	Image data format	M	7.40	—	
36	Camera to subject distance	O	7.41	—	
37	Sensor diagonal	O	7.42	—	
38	Lens focal length	O	7.43	—	
39	Image size block	O	7.44	—	This block is under "2D image information block" (No. 31).
40	Width	O	7.45	—	These DOs are "Image size block" (No. 39).
41	Height	O	7.46	—	
42	Image face measurements block	O	7.47	—	This block is under "2D image information block" (No. 31).
43	Image colour space	O	7.52	—	This DO is under "2D image information block" (No. 31).
44	Reference colour mapping block	O	7.53	—	This block is under "2D image information block" (No. 31).
NOTE 1 "M / O" means mandatory / optional. NOTE 2 3D shape representation block, specified in ISO/IEC 39794-5:2019, is not shown in this table.					

6.2 Correspondence between ISO/IEC 19794-5:2005 and ISO/IEC 39794-5:2019

Table 18 shows the correspondence of mandatory data elements in ISO/IEC 19794-5:2005 and data elements in ISO/IEC 39794-5:2019. Both structures are different and the "facial record header" block in ISO/IEC 19794-5:2005 does not have an exact correspondence in ISO/IEC 39794-5:2019. Additional points for consideration are shown at the end of the table.

Table 18 — Correspondence table of data elements in ISO/IEC 19794-5:2005 and ISO/IEC 39794-5:2019

ISO/IEC 19794-5:2005			ISO/IEC 39794-5:2019			Notes
No. in Table 16	Block name	Data element name	No. in Table 17	Block/data element name	M / O	
1	Facial record header	Format identifier	—	—	—	These data elements are general information, so their correspondence will not be considered.
2		Version number				
3		Length of record				
4		Number of facial images	—	—	—	Multiple face images can be encoded by multiple representation blocks (See No.3, Table 17).
NOTE 1 "M / O" means mandatory / optional. NOTE 2 Feature point block of ISO/IEC 19794-5:2005 is omitted.						

Table 18 *(continued)*

ISO/IEC 19794-5:2005			ISO/IEC 39794-5:2019			Notes
No. in Table 16	Block name	Data element name	No. in Table 17	Block/data element name	M / O	
5	Facial information block	Facial record data length	—	—	—	The role of this data element is transferred to "L" of TLV format.
6		Number of feature points	3, 24	Landmark block in representation block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data element in ISO/IEC 39794-5:2019 is omitted. See NOTE 2.
7		Gender	13, 14	Gender in identity metadata block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data elements in ISO/IEC 39794-5:2019 are omitted.
8		Eye colour	13, 15	Eye colour in identity metadata block	O	
9		Hair colour	13, 16	Hair colour in identity metadata block	O	
10		Property mask	13, 18	Property block in identity metadata block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data elements in ISO/IEC 39794-5:2019 are omitted. "Blink" and "Feature distorting medical condition" in ISO/IEC 19794-5:2005 are changed to "pupil or iris not visible" and "biometric absent" respectively in ISO/IEC 39794-5:2019.
11		Expression	13, 19	Expression block in identity metadata block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data elements in ISO/IEC 39794-5:2019 are omitted.
12		Pose angle	21, 22	Yaw/pitch/roll angle value in yaw/pitch/roll angle data block	O	If '181' ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, this data element is omitted.
13		Pose angle uncertainty	21, 23	Yaw/pitch/roll angle uncertainty in Yaw/pitch/roll angle data block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data elements in ISO/IEC 39794-5:2019 are omitted.
18	Image information block	Face image type	31, 32	2D face image kind in 2D image representation block	O	If needed, "MRTD" may be set in ISO/IEC 39794-5:2019 encoding, instead of, for example, "Full frontal" in ISO/IEC 19794-5:2005.
19		Image data type	31, 35	Image data format in 2D image information lock	M	"JPEG2000" in ISO/IEC 19794-5:2005 is expanded to "JPEG2000 lossy" and "JPEG2000 lossless".
20		Width	39, 40	Width in image size block	O	—
21		Height	39, 41	Height in image size lock	O	
22		Image colour space	31, 43	Image colour space in 2D image information block	O	If zero ("unspecified") is set in ISO/IEC 19794-5:2005 encoding, the correspondence data elements may be omitted.
23		Source type	28, 30	2D capture device technology identifier in 2D capture device block	O	
24		Device type	10, 11	Model identifier block in capture device block	O	
25		Quality	3, 6	Quality blocks in 2D image information block	O	
26	Image data block	Data structure	26, 27	2D representation data in 2D image representation block	M	—

NOTE 1 "M / O" means mandatory / optional.

NOTE 2 Feature point block of ISO/IEC 19794-5:2005 is omitted.

6.3 Examples based on ISO/IEC 39794-5:2019

6.3.1 Minimal example using mandatory data elements

Table 19 is a minimal example using only mandatory data elements.

Table 19 — Example coding in ISO/IEC 39794-5:2019, using minimal (mandatory only) data elements

Tag	L	Value
0x65	Var.	Face image data block.

Tag	L	Value
0xA0	7	Version block.

Tag	L	Value
0x80	1	Generation number of the International Standard. “3” (0x3) is set if ISO/IEC 39794-5:2019 is used. See ISO/IEC 39794-1:2019.
0x81	2	Publication year of the International Standard. “2019” (0x7E3) is set if ISO/IEC 39794-5:2019 is used. See ISO/IEC 39794-1:2019.

Tag	L	Value
0xA1	Var.	Representation blocks.

Tag	L	Value
0x30	Var.	Representation block.

Tag	L	Value
0x80	Var.	Representation identifier. The non-negative unique number is assigned on each representation block. For example, the first identifier is zero (0x0), followed by increments of one.
0xA1	Var.	Image representation.

Tag	L	Value
0xA0	Var.	Image representation base.

Tag	L	Value
0xA0	Var.	Image representation 2D block.

Tag	L	Value
0x80	Var.	Representation data 2D, containing image data, for example, JPEG image data, as octet string.
0xA1	5	Image information 2D block.

Tag	L	Value
0xA0	3	Code of image data format.

Tag	L	Value
0x80	1	Code of Image data format. "2" (0x2) is set in case of JPEG. "3" (0x3) is set in case of JPEG2000Lossy. Other codes would be referenced in ISO/IEC 39794-5:2019.

6.3.2 Example using all data elements of ISO/IEC 19794-5:2005

Table 20 provides an example for when eMRTD issuers consider that all data elements of ISO/IEC 19794-5:2005 would be kept in the case of coding in ISO/IEC 39794-5:2019.

Table 20 — Example coding in ISO/IEC 39794-5:2019, using data elements compatible to ISO/IEC 19794-5:2005

Tag	L	Value
0x65	Var.	Face image data block.

Tag	L	Value
0xA0	7	Version block.

Tag	L	Value
0x80	1	Generation number of the International Standard. “3” (0x3) is set if ISO/IEC 39794-5:2019 is used. See ISO/IEC 39794-1:2019.
0x81	2	Publication year of the International Standard. “2019” (0x7E3) is set if ISO/IEC 39794-5:2019 is used. See ISO/IEC 39794-1:2019.

Tag	L	Value
0xA1	Var.	Representation blocks.

Tag	L	Value
0x30	Var.	Representation block.

Tag	L	Value
0x80	Var.	Representation identifier. The non-negative unique number is assigned on each representation block. For example, the first identifier is zero (0x0), followed by increments of one.
0xA1	Var.	Image representation.

Tag	L	Value
0xA0	Var.	Image representation base.

Tag	L	Value
0xA0	Var.	Image representation 2D block.

Tag	L	Value
0x80	Var.	Representation data 2D, containing image data, for example, JPEG image data, as octet string.
0xA1	Var.	Image information 2D block.

Tag	L	Value
0xA0	3	Image data format.

Tag	L	Value
0x80	1	Code of image data format. "2" (0x2) is set in case of JPEG. "3" (0x3) is set in case of JPEG2000Lossy. Other codes can be referenced in ISO/IEC 39794-5:2019.

Tag	L	Value
0xA1	3	Face image kind 2D.

Table 20 *(continued)*

																Tag	**L**	**Value**
																0x80	1	Zero (0x0) is set in case of MRTD. Face image types, such as “full frontal” in ISO/IEC 19794-5:2005 are removed.
														Tag	**L**	**Value**		
														0xA7	Var.	Image size block.		
																Tag	**L**	**Value**
																0x80	Var.	Width.
																0x81	Var.	Height.
														Tag	**L**	**Value**		
														0xA9	3	Image colour space. If "code of image colour space" is omitted, this is also omitted.		
																Tag	**L**	**Value**
																0x80	1	Code of image colour space. "Unspecified" in ISO/IEC 19794-5:2005 is removed in ISO/IEC 39794-5:2019. If "unspecified" is preferred, this is omitted.
												Tag	**L**	**Value**				
												0xA2	5	Capture device 2D block. If "capture device technology ID 2D" is omitted, this is also omitted.				
														Tag	**L**	**Value**		
														0xA1	3	Capture device technology ID 2D. If "code of capture device technology ID 2D" is omitted, this is also omitted.		
																Tag	**L**	**Value**
																0x80	1	Code of capture device technology ID 2D. "Unspecified" in ISO/IEC 19794-5:2005 is removed in ISO/IEC 39794-5:2019. If "unspecified" is preferred, this is omitted.
						Tag	**L**	**Value**										
						0xA3	Var.	Quality blocks. “Quality” in ISO/IEC 19794-5:2005 is expanded and multiple quality values can be stored in ISO/IEC 39794-1:2019. If there is no “Quality block” below, this is omitted.										
								Tag	**L**	**Value**								
								0x30	Var.	Quality block. If “unspecified” is set in ISO/IEC 19794-5:2005, this is omitted.								
										Tag	**L**	**Value**						

Table 20 *(continued)*

										0xA0	6 to 8	Algorithm ID block.						
												Tag	**L**	**Value**				
												0x80	1 or 2	Quality algorithm vendor ID.				
												0x81	1 or 2	Quality algorithm ID.				
										Tag	**L**	**Value**						
										0xA1	Var.	Score or error, output by quality algorithm.						
												Tag	**L**	**Value**				
												0x80	1	Score.				
												0xA1	Var.	Error.				
														Tag	**L**	**Value**		
														0x80	Var.	Code of error.		
						Tag	**L**	**Value**										
						0xA7	10	Capture device block. If there is no model ID block, this is omitted.										
								Tag	**L**	**Value**								
								0xA0	6 to 8	Model ID block. “Device type” in ISO/IEC 19794-5:2005 is changed to “capture device vendor ID” and “capture device model ID” in ISO/IEC 39794-1:2019. If "unspecified" is set in the case of ISO/IEC 19794-5:2005, this is omitted.								
										Tag	**L**	**Value**						
										0x80	1 or 2	Capture device vendor ID.						
										0x81	1 or 2	Capture device model ID.						
						Tag	**L**	**Value**										
						0xA8	Var.	Identity meta data block. If there is no DO under this, this is omitted.										
								Tag	**L**	**Value**								
								0xA0	3	Gender. If "gender code" is omitted, this is also omitted.								
										Tag	**L**	**Value**						
										0x80	1	Gender code. "Unspecified" in ISO/IEC 19794-5:2005 is removed in ISO/IEC 39794-5:2019. If zero "unspecified" is preferred, this is omitted.						
								Tag	**L**	**Value**								

Table 20 *(continued)*

								0xA1	3	Eye colour. If "code of eye colour" is omitted, this is also omitted.		
										Tag	**L**	**Value**
										0x80	1	Code of eye colour. "Unspecified" in ISO/IEC 19794-5:2005 is removed in ISO/IEC 39794-5:2019. If "unspecified" is preferred, this is omitted.
								Tag	**L**	**Value**		
								0xA2	3	Hair colour. If "code of hair colour" is omitted, this is also omitted.		
										Tag	**L**	**Value**
										0x80	1	Code of hair colour. "Unspecified" in ISO/IEC 19794-5:2005 is removed in ISO/IEC 39794-5:2019. If "unspecified" is preferred, this is omitted.
								Tag	**L**	**Value**		
								0xA4	Var.	Properties block. This can be omitted if all DOs under this are not set true.		
										Tag	**L**	**Value**
										0x80	1	Glasses. Set true or false.
										0x81	1	Moustache. Set true or false.
										0x82	1	Beard. Set true or false.
										0x83	1	Teeth visible. Set true or false.
										0x84	1	Pupil or iris not visible. Set true or false.
										0x85	1	Mouth open. Set true or false.
										0x86	1	Left eye patch. Set true or false.
										0x87	1	Right eye patch. Set true or false.
										0x88	1	Dark glasses. Set true or false.
										0x89	1	Biometric absent. Set true or false.
												Set true or false. DOs that are not set true can be omitted.
								Tag	**L**	**Value**		
								0xA5	Var.	Expression block. This can be omitted if all DOs under this are not set true.		
										Tag	L	Value

Table 20 *(continued)*

										0x80	1	Neutral.						
										0x81	1	Smile.						
										0x82	1	Raised eye brows.						
										0x83	1	Eyes looking away from the camera.						
										0x84	1	Squinting.						
										0x85	1	Frowning.						
								Tag	**L**	**Value**								
								0xA6	Var.	Pose angle block. If there is no DO under this, this is also omitted.								
										Tag	**L**	**Value**						
										0xA0	Var.	Yaw angle block. If there is no DO under this, this is also omitted.						
												Tag	**L**	**Value**				
												0x80	Var.	Angle value in degrees. If '181' ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				
												0x81	1	Angle uncertainty in degrees. If zero ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				
										Tag	**L**	**Value**						
										0xA1	Var.	Pitch angle block. If there is no DO under this, this is also omitted.						
												Tag	**L**	**Value**				
												0x80	Var.	Angle value in degreed. If "181" ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				
												0x81	1	Angle uncertainty in degrees. If zero ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				
										Tag	**L**	**Value**						
										0xA2	Var.	Roll angle block. If there is no DO under this, this is also omitted.						
												Tag	**L**	**Value**				
												0x80	Var.	Angle value in degrees. If "181" ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				
												0x81	1	Angle uncertainty in degrees. If zero ("unspecified") is set in ISO/IEC 19794-5:2005, this is omitted.				

Set true or false.

DOs that are not set true can be omitted.

7 Transition of finger image data

7.1 Data elements of finger image data

7.1.1 Data elements specified in ISO/IEC 19794-4:2005

Table 21 shows data elements specified in ISO/IEC 19794-4:2005. Note that a mandatory element, "Capture device ID" allows an "unspecified" value. If eMRTD issuers set an "unspecified" value in the element, they can omit such an element from biometric data encoded using ISO/IEC 39794-4:2019 when transitioning.

Table 21 — Data elements specified in ISO/IEC 19794-4:2005

	Block name	Data element name	M / O	Clause No. of ISO/IEC 19794-4:2005	Notes
1	General record header	Format identifier	M	8.2.2	
2		Version number	M	8.2.3	
3		Record length	M	8.2.4	
4		Capture device ID	M	8.2.5	A value of all zeros will be acceptable and will indicate that the capture device ID is "unspecified".
5		Image acquisition level	M	8.2.6	
6		Number of finger images	M	8.2.7	This defines the number of "Finger record data".
7		Scale units	M	8.2.8	
8		Scan resolution (horizontal)	M	8.2.9	
9		Scan resolution (vertical)	M	8.2.10	
10		Image resolution (horizontal)	M	8.2.11	
11		Image resolution (vertical)	M	8.2.12	
12		Pixel depth	M	8.2.13	
13		Image compression algorithm	M	8.2.14	
14		Reserved	M	8.2.15	This field is always set to “0x00”.

NOTE 1 “M/O” means mandatory/optional.

NOTE 2 ISO/IEC 19794-4:2005 is also used for palm images but the word "palm" is omitted in this table to avoid confusion.

Table 21 *(continued)*

	Block name	Data element name	M / O	Clause No. of ISO/IEC 19794-4:2005	Notes
15	Finger record header	Length of finger data block	M	8.3.2	A finger header starts each section of finger data providing information for that view of, for example, a single finger image.
16		Finger position	M	8.3.3	
17		Count of views	M	8.3.4	A single image is managed in a unit called a view in ISO/IEC 19794-4:2005. This one-byte field contains the total number of specific views available for this finger.
18		View number	M	8.3.5	This one-byte field contains the specific image view number associated with the finger.
19		Finger image quality	M	8.3.6	
20		Impression type	M	8.3.7	
21		Horizontal line length	M	8.3.8	
22		Vertical line length	M	8.3.9	
23		Reserved	M	8.3.10	This field is always set to “0x00”.
24		Finger image data	M	8.3.11	

NOTE 1 “M/O” means mandatory/optional.

NOTE 2 ISO/IEC 19794-4:2005 is also used for palm images but the word "palm" is omitted in this table to avoid confusion.

7.1.2 Data elements specified in ISO/IEC 39794-4:2019

Table 22 shows data elements specified in ISO/IEC 39794-4:2019. Each data element has its own tag number that can be found in Annex C.

Table 22 — Data elements specified in ISO/IEC 39794-4:2019

	Block/element name	M / O	Clause No. of ISO/IEC 39794-4:2019	Clause No. of ISO/IEC 39794-1:2019	Notes
1	Finger image data block	M	7.2	—	
2	Version block	M	7.3	8.2	This block is under “Finger image data block” (No. 1). This block is a sequence of two integers: one is the generation of biometric data and the other is the year of the International Standard publication. In the case of ISO/IEC 39794-5:2019, the generation is “3” (0x3) and the year is “2019” (0x7E3).
3	Representation blocks	M	7.4	—	This block is under “Finger image data block” (No. 1) Multiple representation blocks can exist.

NOTE “M/O” means mandatory/optional.

Table 22 *(continued)*

	Block/element name	M / O	Clause No. of ISO/IEC 39794-4:2019	Clause No. of ISO/IEC 39794-1:2019	Notes
4	Position	M	7.5	—	These DOs are under "Representation block" (No. 3).
5	Impression	M	7.6	—	
6	Image data format	M	7.7	—	
7	Image data	M	7.8	—	
8	Capture date/time block	O	7.9	8.3.2	
9	Capture device block	O	7.10	8.3.1	
10	Model identifier block	O	7.10.1	8.3.1.1	These blocks are under "Capture device block" (No. 9).
11	Capture device technology identifier	O	7.10.2	8.3.1.2	
12	Certification identifier blocks	O	7.10.3	8.3.1.3	
13	Quality blocks	O	7.11	8.3.3	These blocks are under "Representation block" (No. 3).
14	Spatial sampling rate block	O	7.12	—	
15	Position computed by capture device	O	7.13	—	
16	Original rotation	O	7.14	—	
17	Image rotated to vertical	O	7.15	—	
18	Image has been lossily compressed	O	7.16		
19	Segmentation blocks	O	7.17	—	
20	Annotation blocks	O	7.18	—	
21	PAD data block	O	7.19	8.3.4	This block is under "Representation block" (No. 3) This is newly added for presentation attack detection.
22	Comment Blocks	O	7.20	–	These blocks are under "Representation Block" (No. 3)
23	Vender Specific Data Blocks	O	7.21	–	

NOTE "M/O" means mandatory/optional.

7.2 Correspondence between ISO/IEC 19794-4:2005 and ISO/IEC 39794-4:2019

Table 23 shows the correspondence of data elements in ISO/IEC 19794-4:2005 and ISO/IEC 39794-4:2019. Both structures are different and the "fingerprint record header" block in ISO/IEC 19794-4:2005 does not have an exact correspondence in ISO/IEC 39794-4:2019. Additional points for consideration are shown at the end of the table.

Table 23 — Correspondence table of data elements in ISO/IEC 19794-4:2005 and in ISO/IEC 39794-4:2019

ISO/IEC 19794-4:2005			ISO/IEC 39794-4:2019			Notes
No. in Table 21	Block name	Data element name	No. in Table 22	Block/data element name	M / O	
1	General record header	Format identifier	—	—	—	These data elements are general information, so their correspondence will not be considered.
2		Version number				
3		Record length				
4		Capture device ID	9, 10	Model identifier block	O	If zero ("unspecified") is set in ISO/IEC 19794-4:2005 encoding, the correspondence data elements can be omitted.
5		Image acquisition level	—	—	—	These DOs were removed in ISO/IEC 39794-4:2019.
6		Number of finger images	—	—	—	
7		Scale units	3, 14	Spatial sampling rate block in representation block	O	"Scale units" in ISO/IEC 19794-4:2005 is renamed as "Unit dimension" in ISO/IEC 39794-4:2019, which is located under the Spatial sampling rate block.
8		Scan resolution (horizontal)	—	—	—	These DOs were removed in ISO/IEC 39794-4:2019.
9		Scan resolution (vertical)	—	—	—	See also a note of Image resolution (horizontal / vertical) in ISO/IEC 19794-4:2005 (No. 10 and No. 11 in this table).
10		Image resolution (horizontal)	3, 14	Spatial sampling rate block in representation block	O	ISO/IEC 39794-4:2019 takes the same resolution both in horizontal and vertical directions.
11		Image resolution (vertical)				Image resolution is set in "Sample per unit" under "Spatial sampling rate block". See ISO/IEC 39794-4:2019 to obtain details of "Sample per unit".
12		Pixel depth	—	—	—	This DO is removed in ISO/IEC 39794-4:2019.
13		Image compression algorithm	3, 6	Image data format in representation block	M	"JPEG2000" in ISO/IEC 19794-4:2005 is expanded to "JPEG2000 lossy" and "JPEG2000 lossless".
14		Reserved	—	—	—	This DO is removed in ISO/IEC 39794-4:2019.

NOTE 1 "M/O" means mandatory/optional.

NOTE 2 The technological side of "Impression type" in ISO/IEC 19794-4:2005 is separated to "Capture device technology identifier" in ISO/IEC 39794-4:2019. "Capture device technology identifier" (optional) is shown as No. 11 in Table 22, and enables eMRTD issuers to identify a detail device technology, such as "opticalTIRBrightField", "opticalTIRDarkField", "scannedInkOnPaper" etc., if needed. Available identifiers can be found in ISO/IEC 39794-4:2019, Table 3. See Table 25 as an example.

ISO/IEC 19794-4:2005			ISO/IEC 39794-4:2019			Notes
No. in Table 21	Block name	Data element name	No. in Table 22	Block/data element name	M / O	
15	Finger record header	Length of finger data block	—	—	—	The role of this data element is transferred to "L" of TLV format.
16		Finger position	4	Position	M	Position codes are expanded in ISO/IEC 39794-4:2019, but if the value from "0" to "15" is set in ISO/IEC 19794-4:2005, backward compatibility is kept in ISO/IEC 39794-4:2019.
17		Count of views	—	—	—	The role of this data element is transferred to "L" of TLV format.
18		View number	—	—	—	This DO is removed in ISO/IEC 39794-4:2019.
19		Finger image quality	3, 13	Quality blocks in representation block	O	If zero ("unspecified") is set in ISO/IEC 19794-4:2005 encoding, the correspondence data elements can be omitted.
20		Impression type	3, 5	Impression in representation block	M	"live-scan plain" ("0") and "non-live-scan plain" ("2") in ISO/IEC 19794-4:2005 are replaced with "contactPlain" ("0") in ISO/IEC 39794-4:2019. See NOTE 2 of this table.
21		Horizontal line length	—	—	—	These DOs are removed in ISO/IEC 39794-4:2019.
22		Vertical line length	—	—	—	
23		Reserved	—		—	
24	Image data block	Finger image data	3, 7	Image data in representation block	M	—

NOTE 1 "M/O" means mandatory/optional.

NOTE 2 The technological side of "Impression type" in ISO/IEC 19794-4:2005 is separated to "Capture device technology identifier" in ISO/IEC 39794-4:2019. "Capture device technology identifier" (optional) is shown as No. 11 in Table 22, and enables eMRTD issuers to identify a detail device technology, such as "opticalTIRBrightField", "opticalTIRDarkField", "scannedInkOnPaper" etc., if needed. Available identifiers can be found in ISO/IEC 39794-4:2019, Table 3. See Table 25 as an example.

7.3 Examples based on ISO/IEC 39794-4:2019

7.3.1 Minimal example using mandatory data elements

Table 24 is a minimal example using only mandatory data elements.

Table 24 — Example coding in ISO/IEC 39794-4:2019, using minimal (mandatory only) data elements

Tag	L	Value				
0x64	Var.	Finger image data block.				
		Tag	L	Value		
		0xA0	7	Version block.		
				Tag	L	Value
				0x80	1	Generation number of the International Standard. "3" (0x3) is set if ISO/IEC 39794-:2019 is used. See ISO/IEC 39794-1:2019.
				0x81	2	Publication year of the International Standard. "2019" (0x7E3) is set if ISO/IEC 39794-4:2019 is used. See ISO/IEC 39794-1:2019.
		Tag	L	Value		

Table 24 *(continued)*

		0xA1	Var.	Representation blocks.						
				Tag	**L**	**Value**				
				0x30	Var.	Representation block.				
						Tag	**L**	**Value**		
						0xA0	Var.	Position.		
								Tag	**L**	**Value**
								0x80	Var.	Position code. Position codes are expanded in ISO/IEC 39794-4:2019, but if the value from "0" to "15" is set in ISO/IEC 19794-4:2005, backward compatibility is kept in ISO/IEC 39794-4:2019.
						Tag	**L**	**Value**		
						0xA1	3	Impression		
.								**Tag**	**L**	**Value**
								0x80	1	Impression code. "live-scan plain" ("0") and "nonlive-scan plain" ("2") in ISO/IEC 19794-4:2005 are replaced with "contactPlain" ("0") in ISO/IEC 39794-4:2019.
						Tag	**L**	**Value**		
						0xA2	3	Image data format.		
								Tag	**L**	**Value**
								0x80	1	Image data format code. "Jpeg2000" in ISO/IEC 19794-4:2005 is expanded to "JPEG2000 lossy" and "JPEG2000 lossless".
						Tag	**L**	**Value**		
						0x83	Var.	Image data as octet string.		

7.3.2 Example using typical data elements

If eMRTD issuers consider typical data elements of ISO/IEC 39794-4:2019 would be stored, Table 25 can be used as an example.

Table 25 — Example coding in ISO/IEC 39794-4:2019 using typical data elements

Tag	L	Value								
0x64	Var.	Finger image data block.								
		Tag	**L**	**Value**						
		0xA0	7	Version block.						
				Tag	**L**	**Value**				
				0x80	1	Generation number of the International Standard. “3” (0x3) is set if ISO/IEC 39794-:2019 is used. See ISO/IEC 39794-1:2019.				
				0x81	2	Publication year of the International Standard. “2019” (0x7E3) is set if ISO/IEC 39794-4:2019 is used. See ISO/IEC 39794-1:2019.				
		Tag	**L**	**Value**						
		0xA1	Var.	Representation blocks.						
				Tag	**L**	**Value**				
				0x30	Var.	Representation block.				
						Tag	**L**	**Value**		
						0xA0	Var.	Position.		
								Tag	**L**	**Value**
								0x80	Var.	Position code. Position codes are expanded in ISO/IEC 39794-4:2019, but if the value from “0” to “15” is set in ISO/IEC 19794-4:2005, backward compatibility is kept in ISO/IEC 39794-4:2019.
						Tag	**L**	**Value**		
						0xA1	3	Impression.		
								Tag	**L**	**Value**
								0x80	1	Impression code. “live-scan plain” (“0”) and “nonlive-scan plain” (“2”) in ISO/IEC 19794-4:2005 are replaced with “contactPlain” (“0”) in ISO/IEC 39794-4:2019.
						Tag	**L**	**Value**		
						0xA2	3	Image data format.		
								Tag	**L**	**Value**
								0x80	1	Image data format code. “JPEG2000” in ISO/IEC 19794-4:2005 is expanded to “JPEG2000 lossy” and “JPEG2000 lossless”.
						Tag	**L**	**Value**		
						0x83	Var.	Image data as octet string.		

Table 25 *(continued)*

						Tag	L	Value				
						0xA4	Var.	Capture date time block.				
								Tag	L	Value		
								0x80	2	Year.	At least one DO is needed, but, for example, if “second” and “millisecond” DOs are unnecessary, they are omitted.	
								0x81	1	Month.		
								0x82	1	Day.		
								0x83	1	Hour.		
								0x84	1	Minute.		
								0x85	1	Second.		
								0x86	1 or 2	Millisecond.		
						Tag	L	Value				
						0xA5	11 to 13	Capture device block. If there is no model ID block, this is omitted.				
								Tag	L	Value		
								0xA0	6 to 8	Model ID block. “Device type” in ISO/IEC 19794-4:2005 is changed to “capture device vendor ID” and “capture device model ID” in ISO/IEC 39794-1:2019. If “unspecified” is set in the case of ISO/IEC 19794-4:2005, this is omitted.		
										Tag	L	Value
										0x80	1	Capture device vendor ID.
										0x81	1	Capture device model ID.
								Tag	L	Value		
								0xA1	3	Capture device technology ID.		
										Tag	L	Value
										0x80	1	Capture device technology ID code. This DO is newly added in ISO/IEC 39794-4:2019, which can indicate the technological side of a capture device, such as“opticalTIRBrightField”, “opticalTIRDarkField”, “scannedInkOnPaper” etc..
						Tag	L	Value				
						0xA6	Var.	Quality blocks.				
								Tag	L	Value		
								0x30	Var.	Quality block. If “unspecified” is set in ISO/IEC 19794-4:2005, this is omitted.		

Table 25 *(continued)*

										Tag	**L**	**Value**					
										0xA0	6 to 8	Quality algorithm identifier block.					
												Tag	**L**	**Value**			
												0x80	1 or 2	Quality algorithm vendor ID.			
												0x81	1 or 2	Quality algorithm ID.			
										Tag	**L**	**Value**					
										0xA1	Var.	Score or error, output by quality algorithm.					
												Tag	**L**	**Value**			
												0x80	1	Score.			
												0xA1	Var.	Error.			
														Tag	**L**	**Value**	
														0x80	Var.	Code of error	
						Tag	**L**	**Value**									
						0xA7	Var.	Spatial sampling rate block.									
								Tag	**L**	**Value**							
								0x80	Var.	Samples per unit.							
								0x81	1	Unit dimension code.							
						Tag	**L**	**Value**									
						0x8B	1	Image has been lossily compressed. Set true or false. DO that is not set true can be omitted.									

8 Implementation of iris image data

8.1 Data elements of iris image data

Table 26 shows data elements specified in ISO/IEC 39794-6:2021. Each data element has its own tag number that can be found in Annex D.

Table 26 — Data elements specified in ISO/IEC 39794-6:2021

	Block/element name	M / O	Clause No. of ISO/IEC 39794-6:2021	Clause No. of ISO/IEC 39794-1:2019	Notes
1	Iris image data block	M	7	—	
2	Version block	M	7.2	8.2	This block is under "Iris image data block" (No. 1). This block is a sequence of two integers: one is the generation of biometric data and the other is the year of the International Standard publication. In the case of ISO/IEC 39794-6:2021, the generation is "3" (0x3) and the year is "2019" (0xxxx).
3	Representation block	M	7.3		This block is under "Iris image data block" (No. 1). Multiple representation blocks can exist.
4	Eye label	M	7.3.1	—	This block is under "Representation block" (No. 3).
5	Iris image kind	M	7.3.2	—	
6	Bit depth	M	7.3.4	—	
7	Image data format	M	7.3.5	—	
8	Horizontal orientation	M	7.3.6	—	
9	Vertical orientation	M	7.3.7	—	
10	Compression history	M	7.3.8	—	
11	Capture date/time block	M	7.3.9	8.3.2	
12	Iris image data	M	7.3.10	—	
13	Range	O	7.3.11	—	
14	Capture device block	O	7.3.12	8.3.1	
15	Model identifier block	O	7.3.12.1	8.3.1.1	These DOs are under "Capture device block" (No. 14).
16	Capture device technology identifier	O	7.3.12.2	8.3.1.2	
17	Certification identifier blocks	O	7.3.12.3	8.3.1.3	
18	Quality blocks	O	7.3.13	8.3.3	This block is under "Representation block" (No. 3) This is expanded and can contain multiple qualities generated by multiple quality evaluation algorithms respectively.
19	Roll angle block	O	7.3.14	—	This block is under "Representation block" (No. 3).
20	Relative roll angle	O	7.3.14.2	—	This block is under "Roll angle block" (No. 19).
21	Roll angle uncertainty	O	7.3.14.3	—	

NOTE "M/O" means mandatory/optional.

Table 26 *(continued)*

	Block/element name	M / O	Clause No. of ISO/IEC 39794-6:2021	Clause No. of ISO/IEC 39794-1:2019	Notes
22	Localization block	O	7.3.15	—	This block is under "Representation block" (No. 3).
23	Iris centre X smallest	O	7.3.15.2	—	This block is under "Localization block" (No. 22).
24	Iris centre X largest	O	7.3.15.3	—	
25	Iris centre Y smallest	O	7.3.15.4	—	
26	Iris centre Y largest	O	7.3.15.5	—	
27	Iris diameter smallest	O	7.3.15.6	—	
28	Iris diameter largest	O	7.3.15.7	—	
29	PAD data block	O	7.3.16	8.3.4	This block is under "Representation block" (No. 3).
NOTE "M/O" means mandatory/optional.					

8.2 Example based on ISO/IEC 39794-6:2021

Table 27 is a minimal example using only mandatory data elements.

Table 27 — Example coding in ISO/IEC 39794-6:2021, using minimal (mandatory only) data elements

Tag	L	Value								
0x66	Var.	Iris image data block.								
		Tag	L	Value						
		0xA0	7	Version block.						
				Tag	L	Value				
				0x80	1	Generation number of the International Standard. "3" (0x3) is set if ISO/IEC 39794-6:2021 is used. See ISO/IEC 39794-1:2019.				
				0x81	2	Publication year of the International Standard. "2019" (0xxxx) is set if ISO/IEC 39794-6:2021 is used. See ISO/IEC 39794-1:2019.				
		Tag	L	Value						
		0xA1	Var.	Representation blocks.						
				Tag	L	Value				
				0x30	Var.	Representation block.				
						Tag	L	Value		
						0x80	1	Code of eye label.		
						0xA1	3	Iris image kind		
								Tag	L	Value
								0x80	1	Code of iris image kind
						Tag	L	Value		
						0x82	1	Value of bit depth		
						0xA3	3	Image data format		
								Tag	L	Value
								0x80	1	Code of image data format
						Tag	L	Value		
						0x84	1	Code of horizontal orientation		
						0x85	1	Code of vertical orientation		

Table 27 *(continued)*

						0x86	1	Code of compression history			
						0xA7	Var.	Capture date time block.			
								Tag	**L**	**Value**	
								0x80	2	Year.	At least one DO is needed, but, for example, if "second" and "millisecond" DOs are unnecessary, they are omitted.
								0x81	1	Month.	
								0x82	1	Day.	
								0x83	1	Hour.	
								0x84	1	Minute.	
								0x85	1	Second.	
								0x86	1 or 2	Millisecond.	
						Tag	**L**	**Value**			
						0x88	Var.	Iris image data			

Annex A
(informative)

Abstract syntax of the biometric data template in the logical data structure of eMRTDs in ASN.1

```
ISO-IEC-49794-BiometricDataTemplate-ed-1-v1
   {iso(1) standard(0) iso-iec-49794(49794) ed-1(1) v1(1) iso-iec-49794-
biometricdatatemplate(0)}

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-- DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
-- THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
-- (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF
-- THE CODE COMPONENTS, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

DEFINITIONS IMPLICIT TAGS ::= BEGIN

IMPORTS
   FingerImageDataBlock FROM ISO-IEC-39794-4-ed-1-v1
   FaceImageDataBlockFROM ISO-IEC-39794-5-ed-1-v1
   IrisImageDataBlockFROM ISO-IEC-39794-6-ed-1-v1;

BDB-FORMAT-TYPE ::= TYPE-IDENTIFIER

-- ==========================================
-- Object identifiers for ISO/IEC 39794 series
-- ==========================================
iso-iec-39794-4OBJECT IDENTIFIER ::= {iso(1) standard(0) iso-iec-39794(39794) part-4(4)}
iso-iec-39794-5OBJECT IDENTIFIER ::= {iso(1) standard(0) iso-iec-39794(39794) part-5(5)}
iso-iec-39794-6OBJECT IDENTIFIER ::= {iso(1) standard(0) iso-iec-39794(39794) part-6(6)}

-- ================================
-- BDB format types to be recognized
-- ================================
SupportedFormatType BDB-FORMAT-TYPE ::= {
   {FingerImageDataBlock    IDENTIFIED BY iso-iec-39794-4} |
   {FaceImageDataBlock      IDENTIFIED BY iso-iec-39794-5} |
   {IrisImageDataBlock      IDENTIFIED BY iso-iec-39794-6},
```

```
    ...
}

BiometricDataBlock ::= [APPLICATION 46] SEQUENCE OF [1] BDB-FORMAT-
TYPE.&Type({SupportedFormatType})

END
```

Annex B
(informative)

Tag list automatically generated from ISO/IEC 39794-5:2019

This tag list is derived from the ASN.1 module in ISO/IEC 39794-5, by applying the distinguished encoding rules (DER) of ASN.1. In case of conflict between this tag list and the ASN.1 module, the latter takes precedence.

```
List of ASN.1 Tags 39794-5

0x65 - FaceImageDataBlock
 - 0xA0 - versionBlock of type VersionBlock
 -  - 0x80 - generation of type VersionGeneration
 -  - 0x81 - year of type Year
 - 0xA1 - representationBlocks of type RepresentationBlocks
 -  - 0x30 - RepresentationBlock of type RepresentationBlock
 -  -  - 0x80 - representationId of type BerInteger
 -  -  - 0xA1 - imageRepresentation of type ImageRepresentation
 -  -  -  - 0xA0 - base of type ImageRepresentationBase
 -  -  -  -  - 0xA0 - imageRepresentation2DBlock of type ImageRepresentation2DBlock
 -  -  -  -  -  - 0x80 - representationData2D of type BerOctetString
 -  -  -  -  -  - 0xA1 - imageInformation2DBlock of type ImageInformation2DBlock
 -  -  -  -  -  -  - 0xA0 - imageDataFormat of type ImageDataFormat
 -  -  -  -  -  -  -  - 0x80 - code of type ImageDataFormatCode
 -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type ImageDataFormatExtensionBlock
 -  -  -  -  -  -  - 0xA1 - faceImageKind2D of type FaceImageKind2D
 -  -  -  -  -  -  -  - 0x80 - code of type FaceImageKind2DCode
 -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type FaceImageKind2DExtensionBlock
 -  -  -  -  -  -  -  -  - 0x80 - fallback of type FaceImageKind2DCode
 -  -  -  -  -  -  - 0xA2 - postAcquisitionProcessingBlock of type
PostAcquisitionProcessingBlock
 -  -  -  -  -  -  -  - 0x80 - rotated of type BerBoolean
 -  -  -  -  -  -  -  - 0x81 - cropped of type BerBoolean
 -  -  -  -  -  -  -  - 0x82 - downSampled of type BerBoolean
 -  -  -  -  -  -  -  - 0x83 - whiteBalanceAdjusted of type BerBoolean
 -  -  -  -  -  -  -  - 0x84 - multiplyCompressed of type BerBoolean
 -  -  -  -  -  -  -  - 0x85 - interpolated of type BerBoolean
 -  -  -  -  -  -  -  - 0x86 - contrastStretched of type BerBoolean
 -  -  -  -  -  -  -  - 0x87 - poseCorrected of type BerBoolean
 -  -  -  -  -  -  -  - 0x88 - multiViewImage of type BerBoolean
 -  -  -  -  -  -  -  - 0x89 - ageProgressed of type BerBoolean
 -  -  -  -  -  -  -  - 0x8A - superResolutionProcessed of type BerBoolean
 -  -  -  -  -  -  -  - 0x8B - normalised of type BerBoolean
 -  -  -  -  -  -  - 0xA3 - lossyTransformationAttempts of type
LossyTransformationAttempts
 -  -  -  -  -  -  -  - 0x80 - code of type LossyTransformationAttemptsCode
 -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type LossyTransformationAttemptsExtension
Block
 -  -  -  -  -  -  -  -  - 0x80 - fallback of type LossyTransformationAttemptsCode
 -  -  -  -  -  -  - 0x84 - cameraToSubjectDistance of type CameraToSubjectDistance
 -  -  -  -  -  -  - 0x85 - sensorDiagonal of type SensorDiagonal
 -  -  -  -  -  -  - 0x86 - lensFocalLength of type LensFocalLength
 -  -  -  -  -  -  - 0xA7 - imageSizeBlock of type ImageSizeBlock
 -  -  -  -  -  -  -  - 0x80 - width of type ImageSize
 -  -  -  -  -  -  -  - 0x81 - height of type ImageSize
 -  -  -  -  -  -  - 0xA8 - imageFaceMeasurementsBlock of type ImageFaceMeasurementsBlock
 -  -  -  -  -  -  -  - 0x80 - imageHeadWidth of type BerInteger
 -  -  -  -  -  -  -  - 0x81 - imageInterEyeDistance of type BerInteger
 -  -  -  -  -  -  -  - 0x82 - imageEyeToMouthDistance of type BerInteger
 -  -  -  -  -  -  -  - 0x83 - imageHeadLength of type BerInteger
 -  -  -  -  -  -  - 0xA9 - imageColourSpace of type ImageColourSpace
 -  -  -  -  -  -  -  - 0x80 - code of type ImageColourSpaceCode
 -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type ImageColourSpaceExtensionBlock
```

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 -  -  -  -  -  -  -  -  -  - 0x80 - fallback of type ImageColourSpaceCode
 -  -  -  -  -  -  - 0xAA - referenceColourMappingBlock of type
ReferenceColourMappingBlock
 -  -  -  -  -  -  -  -  - 0x80 - referenceColourSchema of type BerOctetString
 -  -  -  -  -  -  -  -  - 0xA1 - referenceColourDefinitionAndValueBlocks of type ReferenceCo
lourDefinitionAndValueBlocks
 -  -  -  -  -  -  -  -  -  - 0x30 - ReferenceColourDefinitionAndValueBlock of type Reference
ColourDefinitionAndValueBlock
 -  -  -  -  -  -  -  -  -  -  - 0x80 - referenceColourDefinition of type BerOctetString
 -  -  -  -  -  -  -  -  -  -  - 0x81 - referenceColourValue of type BerOctetString
 -  -  -  -  -  -  - 0xA2 - captureDevice2DBlock of type CaptureDevice2DBlock
 -  -  -  -  -  -  - 0xA0 - captureDeviceSpectral2DBlock of type
CaptureDeviceSpectral2DBlock
 -  -  -  -  -  -  -  -  - 0x80 - whiteLight of type BerBoolean
 -  -  -  -  -  -  -  -  - 0x81 - nearInfrared of type BerBoolean
 -  -  -  -  -  -  -  -  - 0x82 - thermal of type BerBoolean
 -  -  -  -  -  -  -  - 0xA1 - captureDeviceTechnologyId2D of type
CaptureDeviceTechnologyId2D
 -  -  -  -  -  -  -  -  - 0x80 - code of type CaptureDeviceTechnologyId2DCode
 -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type CaptureDeviceTechnologyId2DExtension
Block
 -  -  -  -  -  -  -  -  -  - 0x80 - fallback of type CaptureDeviceTechnologyId2DCode
 -  -  -  -  - 0xA1 - shapeRepresentation3DBlock of type ShapeRepresentation3DBlock
 -  -  -  -  -  - 0x80 - representationData3D of type BerOctetString
 -  -  -  -  -  - 0xA1 - imageInformation3DBlock of type ImageInformation3DBlock
 -  -  -  -  -  -  - 0xA0 - representationKind3D of type RepresentationKind3D
 -  -  -  -  -  -  -  - 0xA0 - base of type RepresentationKind3DBase
 -  -  -  -  -  -  -  -  - 0xA0 - vertex3DBlock of type Vertex3DBlock
 -  -  -  -  -  -  -  -  -  - 0xA0 - vertexInformation3DBlocks of type
VertexInformation3DBlocks
 -  -  -  -  -  -  -  -  -  -  - 0x30 - VertexInformation3DBlock of type
VertexInformation3DBlock
 -  -  -  -  -  -  -  -  -  -  -  - 0xA0 - vertexCoordinates3DBlock of type CoordinateCart
esian3DUnsignedShortBlock
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x80 - x of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x81 - y of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x82 - z of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  - 0x81 - vertexId3D of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  - 0xA2 - vertexNormals3DBlock of type CoordinateCartesia
n3DUnsignedShortBlock
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x80 - x of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x81 - y of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x82 - z of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  - 0xA3 - vertexTextures3DBlock of type CoordinateCartesi
an2DUnsignedShortBlock
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x80 - x of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x81 - y of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  - 0x84 - errorMap3D of type BerOctetString
 -  -  -  -  -  -  -  -  -  -  - 0xA1 - vertexTriangleData3DBlocks of type
VertexTriangleData3DBlocks
 -  -  -  -  -  -  -  -  -  -  -  - 0x30 - VertexTriangleData3DBlock of type
VertexTriangleData3DBlock
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x80 - triangleIndex1 of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x81 - triangleIndex2 of type BerInteger
 -  -  -  -  -  -  -  -  -  -  -  -  - 0x82 - triangleIndex3 of type BerInteger
 -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type RepresentationKind3DExtensionBlock
 -  -  -  -  -  -  -  - 0xA1 - coordinateSystem3D of type CoordinateSystem3D
 -  -  -  -  -  -  -  -  - 0x80 - code of type CoordinateSystem3DCode
 -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type CoordinateSystem3DExtensionBlock
 -  -  -  -  -  -  -  -  -  - 0x80 - fallback of type CoordinateSystem3DCode
 -  -  -  -  -  -  -  - 0xA2 - cartesianScalesAndOffsets3DBlock of type CartesianScalesAndOff
sets3DBlock
 -  -  -  -  -  -  -  -  - 0x80 - scaleX of type BerReal
 -  -  -  -  -  -  -  -  - 0x81 - scaleY of type BerReal
 -  -  -  -  -  -  -  -  - 0x82 - scaleZ of type BerReal
 -  -  -  -  -  -  -  -  - 0x83 - offsetX of type BerReal
 -  -  -  -  -  -  -  -  - 0x84 - offsetY of type BerReal
 -  -  -  -  -  -  -  -  - 0x85 - offsetZ of type BerReal
 -  -  -  -  -  -  -  - 0xA3 - imageColourSpace of type ImageColourSpace
 -  -  -  -  -  -  -  -  - 0x80 - code of type ImageColourSpaceCode
 -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type ImageColourSpaceExtensionBlock
```

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 - - - - - - - - - 0x80 - fallback of type ImageColourSpaceCode
 - - - - - - - - 0xA4 - faceImageKind3D of type FaceImageKind3D
 - - - - - - - - - 0x80 - code of type FaceImageKind3DCode
 - - - - - - - - - 0xA1 - extensionBlock of type FaceImageKind3DExtensionBlock
 - - - - - - - - - - 0x80 - fallback of type FaceImageKind3DCode
 - - - - - - - - 0xA5 - imageSizeBlock of type ImageSizeBlock
 - - - - - - - - - 0x80 - width of type ImageSize
 - - - - - - - - - 0x81 - height of type ImageSize
 - - - - - - - - 0xA6 - physicalFaceMeasurements3DBlock of type
PhysicalFaceMeasurements3DBlock
 - - - - - - - - - 0x80 - physicalHeadWidth3D of type BerInteger
 - - - - - - - - - 0x81 - physicalInterEyeDistance3D of type BerInteger
 - - - - - - - - - 0x82 - physicalEyeToMouthDistance3D of type BerInteger
 - - - - - - - - - 0x83 - physicalHeadLength3D of type BerInteger
 - - - - - - - - 0xA7 - postAcquisitionProcessingBlock of type
PostAcquisitionProcessingBlock
 - - - - - - - - - 0x80 - rotated of type BerBoolean
 - - - - - - - - - 0x81 - cropped of type BerBoolean
 - - - - - - - - - 0x82 - downSampled of type BerBoolean
 - - - - - - - - - 0x83 - whiteBalanceAdjusted of type BerBoolean
 - - - - - - - - - 0x84 - multiplyCompressed of type BerBoolean
 - - - - - - - - - 0x85 - interpolated of type BerBoolean
 - - - - - - - - - 0x86 - contrastStretched of type BerBoolean
 - - - - - - - - - 0x87 - poseCorrected of type BerBoolean
 - - - - - - - - - 0x88 - multiViewImage of type BerBoolean
 - - - - - - - - - 0x89 - ageProgressed of type BerBoolean
 - - - - - - - - - 0x8A - superResolutionProcessed of type BerBoolean
 - - - - - - - - - 0x8B - normalised of type BerBoolean
 - - - - - - - - 0xA8 - texturedImageResolution3DBlock of type
TexturedImageResolution3DBlock
 - - - - - - - - - 0x80 - mMShapeXResolution3D of type BerReal
 - - - - - - - - - 0x81 - mMShapeYResolution3D of type BerReal
 - - - - - - - - - 0x82 - mMShapeZResolution3D of type BerReal
 - - - - - - - - - 0x83 - mMTextureResolution3D of type BerReal
 - - - - - - - - - 0x84 - textureAcquisitionPeriod3D of type BerReal
 - - - - - - - - - 0xA5 - faceAreaScanned3DBlock of type FaceAreaScanned3DBlock
 - - - - - - - - - - 0x80 - frontOfTheHead of type BerBoolean
 - - - - - - - - - - 0x81 - chin of type BerBoolean
 - - - - - - - - - - 0x82 - ears of type BerBoolean
 - - - - - - - - - - 0x83 - neck of type BerBoolean
 - - - - - - - - - - 0x84 - backOfTheHead of type BerBoolean
 - - - - - - - - - - 0x85 - fullHead of type BerBoolean
 - - - - - - - - 0xA9 - textureMap3DBlock of type TextureMap3DBlock
 - - - - - - - - - 0x80 - textureMapData3D of type BerOctetString
 - - - - - - - - - 0xA1 - imageDataFormat of type ImageDataFormat
 - - - - - - - - - - 0x80 - code of type ImageDataFormatCode
 - - - - - - - - - - 0xA1 - extensionBlock of type ImageDataFormatExtensionBlock
 - - - - - - - - - 0xA2 - textureCaptureDeviceSpectral3D of type
TextureCaptureDeviceSpectral3D
 - - - - - - - - - - 0x80 - code of type TextureCaptureDeviceSpectral3DCode
 - - - - - - - - - - 0xA1 - extensionBlock of type TextureCaptureDeviceSpectral3DExt
ensionBlock
 - - - - - - - - - - - 0x80 - fallback of type TextureCaptureDeviceSpectral3DCode
 - - - - - - - - - 0xA3 - textureStandardIlluminant3D of type
TextureStandardIlluminant3D
 - - - - - - - - - - 0x80 - code of type TextureStandardIlluminant3DCode
 - - - - - - - - - - 0xA1 - extensionBlock of type TextureStandardIlluminant3DExtens
ionBlock
 - - - - - - - - - - - 0x80 - fallback of type TextureStandardIlluminant3DCode
 - - - - - - - - - 0x84 - errorMap3D of type BerOctetString
 - - - - - - - 0xA2 - captureDevice3DBlock of type CaptureDevice3DBlock
 - - - - - - - - 0xA0 - modus3D of type Modus3D
 - - - - - - - - - 0x80 - code of type Modus3DCode
 - - - - - - - - - 0xA1 - extensionBlock of type Modus3DExtensionBlock
 - - - - - - - - - - 0x80 - fallback of type Modus3DCode
 - - - - - - - - 0xA1 - captureDeviceTechnologyId3D of type
CaptureDeviceTechnologyId3D
 - - - - - - - - - 0x80 - code of type CaptureDeviceTechnologyId3DCode
 - - - - - - - - - 0xA1 - extensionBlock of type CaptureDeviceTechnologyId3DExtension
Block
 - - - - - - - - - - 0x80 - fallback of type CaptureDeviceTechnologyId3DCode
```

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-  -  -  - 0xA1 - extensionBlock of type ImageRepresentationExtensionBlock
-  -  - 0xA2 - captureDateTimeBlock of type CaptureDateTimeBlock
-  -  -  - 0x80 - year of type Year
-  -  -  - 0x81 - month of type Month
-  -  -  - 0x82 - day of type Day
-  -  -  - 0x83 - hour of type Hour
-  -  -  - 0x84 - minute of type Minute
-  -  -  - 0x85 - second of type Second
-  -  -  - 0x86 - millisecond of type Millisecond
-  -  - 0xA3 - qualityBlocks of type QualityBlocks
-  -  -  - 0x30 - QualityBlock of type QualityBlock
-  -  -  -  - 0xA0 - algorithmIdBlock of type RegistryIdBlock
-  -  -  -  -  - 0x80 - organization of type RegistryId
-  -  -  -  -  - 0x81 - id of type RegistryId
-  -  -  -  - 0xA1 - scoreOrError of type ScoreOrError
-  -  -  -  -  - 0x80 - score of type Score
-  -  -  -  -  - 0xA1 - error of type ScoringError
-  -  -  -  -  -  - 0x80 - code of type ScoringErrorCode
-  -  -  -  -  -  - 0xA1 - extensionBlock of type ScoringErrorExtensionBlock
-  -  -  -  -  -  -  - 0x80 - fallback of type ScoringErrorCode
-  -  - 0xA4 - padDataBlock of type PadDataBlock
-  -  -  - 0xA0 - decision of type PADDecision
-  -  -  -  - 0x80 - code of type PADDecisionCode
-  -  -  -  - 0xA1 - extensionBlock of type PADDecisionExtensionBlock
-  -  -  -  -  - 0x80 - fallback of type PADDecisionCode
-  -  -  - 0xA1 - scoreBlocks of type PADScoreBlocks
-  -  -  -  - 0x30 - PADScoreBlock of type PADScoreBlock
-  -  -  -  -  - 0xA0 - mechanismIdBlock of type RegistryIdBlock
-  -  -  -  -  -  - 0x80 - organization of type RegistryId
-  -  -  -  -  -  - 0x81 - id of type RegistryId
-  -  -  -  -  - 0xA1 - scoreOrError of type ScoreOrError
-  -  -  -  -  -  - 0x80 - score of type Score
-  -  -  -  -  -  - 0xA1 - error of type ScoringError
-  -  -  -  -  -  -  - 0x80 - code of type ScoringErrorCode
-  -  -  -  -  -  -  - 0xA1 - extensionBlock of type ScoringErrorExtensionBlock
-  -  -  -  -  -  -  -  - 0x80 - fallback of type ScoringErrorCode
-  -  -  - 0xA2 - extendedDataBlocks of type ExtendedDataBlocks
-  -  -  -  - 0x30 - ExtendedDataBlock of type ExtendedDataBlock
-  -  -  -  -  - 0xA0 - dataTypeIdBlock of type RegistryIdBlock
-  -  -  -  -  -  - 0x80 - organization of type RegistryId
-  -  -  -  -  -  - 0x81 - id of type RegistryId
-  -  -  -  -  - 0x81 - data of type BerOctetString
-  -  -  - 0xA3 - captureContext of type PADCaptureContext
-  -  -  -  - 0x80 - code of type PADCaptureContextCode
-  -  -  -  - 0xA1 - extensionBlock of type PADCaptureContextExtensionBlock
-  -  -  -  -  - 0x80 - fallback of type PADCaptureContextCode
-  -  -  - 0xA4 - supervisionLevel of type PADSupervisionLevel
-  -  -  -  - 0x80 - code of type PADSupervisionLevelCode
-  -  -  -  - 0xA1 - extensionBlock of type PADSupervisionLevelExtensionBlock
-  -  -  -  -  - 0x80 - fallback of type PADSupervisionLevelCode
-  -  -  - 0x85 - riskLevel of type PADRiskLevel
-  -  -  - 0xA6 - criteriaCategory of type PADCriteriaCategory
-  -  -  -  - 0x80 - code of type PADCriteriaCategoryCode
-  -  -  -  - 0xA1 - extensionBlock of type PADCriteriaCategoryExtensionBlock
-  -  -  -  -  - 0x80 - fallback of type PADCriteriaCategoryCode
-  -  -  - 0x87 - parameter of type PADParameter
-  -  -  - 0xA8 - challenges of type PADChallenges
-  -  -  -  - 0x30 - PADChallenge of type PADChallenge
-  -  -  - 0xA9 - captureDateTimeBlock of type CaptureDateTimeBlock
-  -  -  -  - 0x80 - year of type Year
-  -  -  -  - 0x81 - month of type Month
-  -  -  -  - 0x82 - day of type Day
-  -  -  -  - 0x83 - hour of type Hour
-  -  -  -  - 0x84 - minute of type Minute
-  -  -  -  - 0x85 - second of type Second
-  -  -  -  - 0x86 - millisecond of type Millisecond
-  -  - 0x85 - sessionId of type BerInteger
-  -  - 0x86 - derivedFrom of type BerInteger
-  -  - 0xA7 - captureDeviceBlock of type CaptureDeviceBlock
-  -  -  - 0xA0 - modelIdBlock of type RegistryIdBlock
-  -  -  -  - 0x80 - organization of type RegistryId
```

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 -  -  -  -  - 0x81 - id of type RegistryId
 -  -  -  - 0xA1 - certificationIdBlocks of type CertificationIdBlocks
 -  -  -  -  - 0x30 - CertificationIdBlock of type CertificationIdBlock
 -  -  -  -  -  - 0x80 - organization of type RegistryId
 -  -  -  -  -  - 0x81 - id of type RegistryId
 -  -  - 0xA8 - identityMetadataBlock of type IdentityMetadataBlock
 -  -  -  - 0xA0 - gender of type Gender
 -  -  -  -  - 0x80 - code of type GenderCode
 -  -  -  -  - 0xA1 - extensionBlock of type GenderExtensionBlock
 -  -  -  -  -  - 0x80 - fallback of type GenderCode
 -  -  -  - 0xA1 - eyeColour of type EyeColour
 -  -  -  -  - 0x80 - code of type EyeColourCode
 -  -  -  -  - 0xA1 - extensionBlock of type EyeColourExtensionBlock
 -  -  -  -  -  - 0x80 - fallback of type EyeColourCode
 -  -  -  - 0xA2 - hairColour of type HairColour
 -  -  -  -  - 0x80 - code of type HairColourCode
 -  -  -  -  - 0xA1 - extensionBlock of type HairColourExtensionBlock
 -  -  -  -  -  - 0x80 - fallback of type HairColourCode
 -  -  -  - 0x83 - subjectHeight of type SubjectHeight
 -  -  -  - 0xA4 - propertiesBlock of type PropertiesBlock
 -  -  -  -  - 0x80 - glasses of type BerBoolean
 -  -  -  -  - 0x81 - moustache of type BerBoolean
 -  -  -  -  - 0x82 - beard of type BerBoolean
 -  -  -  -  - 0x83 - teethVisible of type BerBoolean
 -  -  -  -  - 0x84 - pupilOrIrisNotVisible of type BerBoolean
 -  -  -  -  - 0x85 - mouthOpen of type BerBoolean
 -  -  -  -  - 0x86 - leftEyePatch of type BerBoolean
 -  -  -  -  - 0x87 - rightEyePatch of type BerBoolean
 -  -  -  -  - 0x88 - darkGlasses of type BerBoolean
 -  -  -  -  - 0x89 - biometricAbsent of type BerBoolean
 -  -  -  -  - 0x8A - headCoveringsPresent of type BerBoolean
 -  -  -  - 0xA5 - expressionBlock of type ExpressionBlock
 -  -  -  -  - 0x80 - neutral of type BerBoolean
 -  -  -  -  - 0x81 - smile of type BerBoolean
 -  -  -  -  - 0x82 - raisedEyebrows of type BerBoolean
 -  -  -  -  - 0x83 - eyesLookingAwayFromTheCamera of type BerBoolean
 -  -  -  -  - 0x84 - squinting of type BerBoolean
 -  -  -  -  - 0x85 - frowning of type BerBoolean
 -  -  -  - 0xA6 - poseAngleBlock of type PoseAngleBlock
 -  -  -  -  - 0xA0 - yawAngleBlock of type AngleDataBlock
 -  -  -  -  -  - 0x80 - angleValue of type AngleValue
 -  -  -  -  -  - 0x81 - angleUncertainty of type AngleUncertainty
 -  -  -  -  - 0xA1 - pitchAngleBlock of type AngleDataBlock
 -  -  -  -  -  - 0x80 - angleValue of type AngleValue
 -  -  -  -  -  - 0x81 - angleUncertainty of type AngleUncertainty
 -  -  -  -  - 0xA2 - rollAngleBlock of type AngleDataBlock
 -  -  -  -  -  - 0x80 - angleValue of type AngleValue
 -  -  -  -  -  - 0x81 - angleUncertainty of type AngleUncertainty
 -  -  - 0xA9 - landmarkBlocks of type LandmarkBlocks
 -  -  -  - 0x30 - LandmarkBlock of type LandmarkBlock
 -  -  -  -  - 0xA0 - landmarkKind of type LandmarkKind
 -  -  -  -  -  - 0xA0 - base of type LandmarkKindBase
 -  -  -  -  -  -  - 0xA0 - mpeg4FeaturePoint of type Mpeg4FeaturePoint
 -  -  -  -  -  -  -  - 0x80 - code of type MPEG4FeaturePointCode
 -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type MPEG4FeaturePointExtensionBlock
 -  -  -  -  -  -  -  -  - 0x80 - fallback of type MPEG4FeaturePointCode
 -  -  -  -  -  -  - 0xA1 - anthropometricLandmark of type AnthropometricLandmark
 -  -  -  -  -  -  -  - 0xA0 - base of type AnthropometricLandmarkBase
 -  -  -  -  -  -  -  -  - 0xA0 - anthropometricLandmarkName of type
AnthropometricLandmarkName
 -  -  -  -  -  -  -  -  -  - 0x80 - code of type AnthropometricLandmarkNameCode
 -  -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type AnthropometricLandmarkNameExte
nsionBlock
 -  -  -  -  -  -  -  -  -  -  - 0x80 - fallback of type AnthropometricLandmarkNameCode
 -  -  -  -  -  -  -  -  - 0xA1 - anthropometricLandmarkPointName of type
AnthropometricLandmarkPointName
 -  -  -  -  -  -  -  -  -  - 0x80 - code of type AnthropometricLandmarkPointNameCode
 -  -  -  -  -  -  -  -  -  - 0xA1 - extensionBlock of type AnthropometricLandmarkPointNam
eExtensionBlock
 -  -  -  -  -  -  -  -  -  -  - 0x80 - fallback of type AnthropometricLandmarkPointNameC
ode
```