

Doc 9303



# Machine Readable Travel Documents

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Part 3  
Machine Readable Official Travel Documents  
Volume 1  
MRtds with Machine Readable Data  
Stored in Optical Character Recognition Format

Approved by the Secretary General  
and published under his authority

Third Edition — 2008

International Civil Aviation Organization

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**ICAO Doc 9303, Machine Readable Travel Documents**  
**Part 3, Machine Readable Official Travel Documents**  
**Volume 1, MRtds with Machine Readable Data Stored in**  
**Optical Character Recognition Format**

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## FOREWORD

The third edition of Doc 9303, Part 3, updates and replaces the specifications for machine readable official travel documents as published in the second edition (2002) and represents a substantial modernization of the material contained in previous editions. In particular, this third edition incorporates the optional new globally interoperable standard for biometric identification of the holder and for the storage of the associated data on a contactless integrated circuit. In consequence, some other biometric identification methods and data storage media, described in the second edition, are no longer to be regarded as options within the globally interoperable standard. States may, however, use them for their own or agreed bilateral purposes.

Such is the magnitude of the specification for the new globally interoperable biometric identification system and the data storage using a contactless integrated circuit, that Doc 9303, Part 3, is now divided into two volumes. The first volume, known as Doc 9303, Part 3, Volume 1, is an updated version of the second edition containing all the specifications required for a State wishing to issue a machine readable official travel document *without* the incorporation of machine-assisted biometric identification. The second volume, known as Doc 9303, Part 3, Volume 2, contains the specifications for enhancing the machine readable official travel document with the globally interoperable system of biometric identification and its associated data storage utilizing a contactless integrated circuit. *A State wishing to issue a machine readable official travel document designed to facilitate cross-border travel with enhanced security by incorporating the globally interoperable machine assisted biometric identification/data storage system will therefore need to comply with both Volumes of Part 3.* Certain specifications within Volume 1, particularly in relation to the portrait and other identification features, have been amended to ensure that when a State decides to upgrade to a globally interoperable biometric document, a minimum amount of change to the document production will be involved.

The expanded specifications and guidance material on matters such as naming conventions, transliteration of national characters in the machine readable zone and the calculation of check digits, have been retained in this first volume of Part 3. The option for the inclusion and placement of an integrated circuit with contact interface, a bar code, magnetic or optical memory stripe on the document remains, as does the option to use biometric identifiers other than facial recognition supported by fingerprint and/or iris data. It is to be emphasized, however, that the inclusion of these storage media and stored data thereon is solely for use by the issuing State or by other States by bilateral agreement, as these are not globally interoperable and no specification for their use is provided in this document.

The emphasis on the security of the document against fraud by alteration or counterfeit is given greater prominence in this third edition, as is the need for security of the premises in which such a travel document is made, personalized and issued, and for the vetting of staff employed in these activities.

A concept highlighted in the second edition was that of "global interoperability". In this context, the term is understood as the capability of inspection systems (either manual or automated) in different States throughout the world to exchange data, to process data received from systems in other States, and to utilize that data in inspection operations in their respective States. Global interoperability is a major objective of the standardized specifications for placement of both eye readable and machine readable data in all MRTDs. In the security-conscious world of today, the need for machine-assisted global interoperability has become pressing. This has necessitated the standardization on one primary biometric identification method and of one method of data storage. The New Technologies Working Group of the Technical Advisory Group on Machine Readable Travel Documents commenced an evaluation in 1998 of the various options and, in early 2001, selected and recommended the face as the primary biometric with contactless integrated circuit as the data storage technology. The recommendation was made specifically in response to the needs of travel document issuing

and immigration authorities to ensure accurate identification of a travel document applicant or holder while minimizing facilitation problems for the traveller. This recommendation was endorsed by the Air Transport Committee of the ICAO Council in 2003.

As specified in Doc 9303, Part 1, provision is made for issuing a passport as a wallet-size card in accordance with the specifications for the Size 1 machine readable official travel document as set forth herein, provided that the issuing State makes appropriate provision for other States to associate visas with it.

These specifications are not intended to be a standard for national identity documents. However, a State whose identity documents are recognized by other States as valid travel documents shall design these identity documents such that they conform to the specifications of Doc 9303, Part 3.

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## ACRONYMS AND DEFINITIONS

<b>Acronym</b>	<b>Full form</b>
AFS	Anti-fraud specialist
AO	Authorizing officer
ERZ	Effective Reading Zone
IC	Integrated circuit
IR	Infra-red radiation
MRP	Machine readable passport
MRP data page	Fixed dimensional page within the MRP containing a standardized presentation of eye and machine readable data
MRTD	Machine Readable Travel Document – generic term covering passport, visa and card
MRtd	Machine Readable Official Travel Document in the form of a card
MRV-A	Full size (Format A) machine readable visa
MRV-B	Small size (Format B) machine readable visa
MRZ	Machine Readable Zone
OCR	Optical Character Recognition
OCR-B	A specific font designed for optical character recognition
OVD	Optically Variable Device
OVF	Optically Variable Feature
DOVID	Diffractive Optically Variable Image Device
PKI	Public Key Infrastructure
td1	Size 1 Machine Readable Official Travel Document
td2	Size 2 Machine Readable Official Travel Document
UV	Ultra-Violet radiation
VIZ	Visual Inspection Zone

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<b>Term</b>	<b>Definition</b>
Anti-scan pattern	An image usually constructed of fine lines at varying angular displacement and embedded in the security background design. When viewed normally, the image cannot be distinguished from the remainder of the background security print but when the original is scanned or photocopied the embedded image becomes visible.
Authorization	A security process to decide whether a service can be given or not.
Biographical data (biodata)	The personal details of the bearer of the document appearing as text in the Visual Inspection and Machine Readable Zones on the biographical data page of an MRTD and/or in the contactless integrated circuit of an eMRTD.
Biometric	A measurable unique, physical characteristic or personal behavioural trait used to recognize the identity, or verify the claimed identity, of a person.
Biometric Data	The information extracted from the biometric and used either to build a reference template (template data) or to compare against a previously created reference template (comparison data).
Biometric Verification	A means of identifying or confirming the identity of the holder of an MRTD by the measurement and validation of one or more unique properties of the holder's person.
Caption	Printed word or phrase to identify a data field.
Card	Medium according to ISO/IEC 7810, ISO/IEC 7811, ISO 7812 used to carry information.
Chemical sensitizers	Security reagents to guard against attempts at tampering by chemical erasure, such that irreversible colours develop when certain chemicals come into contact with the document.
Colour shifting ink	Inks changing their visual characteristic depending on the viewing angle and/or the quality of a stimulating (light) source.
Contactless integrated circuit	A semi-conductor device which stores MRTD data and which communicates with a reader using radio frequency energy according to ISO/IEC 14443.
Control Number	A number assigned to a document at the time of its manufacture for record-keeping and security purposes.
Counterfeit	An unauthorized copy or reproduction of a genuine security document made by whatever means.
Country code	A two- or three-letter code as defined in ISO 3166-1, used to designate a document issuing authority or nationality of the document holder. Only three-letter codes are used in Doc 9303.
Data Features	A data feature involves the incorporation of encoded information into the document data or image structure, usually into the personalization data, especially the portrait.
Diffractive Optically Variable Device	A security feature containing a holographic or equivalent image within its construction, the image changing its appearance with angle of viewing or illumination.

<b>Term</b>	<b>Definition</b>
Diffractive Optically Variable Device (DOVID) Laminate or Overlay	A laminate or overlay containing a DOVID either covering a whole area or located so as to protect key data on the document.
Digital Watermark	See: Steganography.
Document blanks	A document blank is a travel document that does not contain the biographical data personalized details of a document holder. Typically, document blanks are the base stock from which personalized travel documents are created.
Document number	A number that uniquely identifies a document. It is recommended that the document number and the control number be identical.
Duplex design	A design made up of an interlocking pattern of small irregular shapes, printed in two or more colours and requiring very close register printing in order to preserve the integrity of the image.
Effective reading zone (ERZ)	A fixed-dimensional area, common to all MRTDs, in which the machine readable data in the MRZ can be read by document readers.
Electronically enabled td1 or td2 (e-td1 or e-td2)	A td1 or td2 conforming to the specifications of Doc 9303, Part 3, Volume 1, that additionally incorporates a contactless integrated circuit including the capability of biometric identification of the td1 or td2 holder, in accordance with the specifications of Doc 9303, Part 3, Volume 2.
Embedded image	An image or information encoded or concealed within a primary visual image. Also see steganography.
Encryption	The act of disguising information through the use of a key so that it cannot be understood by an unauthorized person.
ePassport (eMRP or Electronically-enabled MRP)	A machine readable passport (MRP) containing a Contactless Integrated Circuit (IC) chip within which is stored data from the MRP data page, a biometric measure of the passport holder, and a security object to protect the data with PKI cryptographic technology, and which conforms to the specifications of Doc 9303, Part 1.
Fibres	Small, thread-like particles embedded in a substrate during manufacture for security purposes.
Field	Specified space for an individual data element within a zone.
Fingerprint(s)	One (or more) visual representation(s) of the surface structure of the holder's fingertip(s).
Fluorescent ink	Ink containing material that glows when exposed to light at a specific wavelength (usually UV) and that ceases to glow immediately after the illuminating light source has been extinguished.
Forgery	See: Fraudulent Alteration.

<b>Term</b>	<b>Definition</b>
Fraudulent Alteration	Involves the alteration of a genuine document in an attempt to enable it to be used for travel by an unauthorized person or to an unauthorized destination. The biographical details of the genuine holder, particularly the portrait, form the prime target for such alteration.
Front-to-back (see-through) register	A design printed on both sides of the document or an inner page of an MRP which when viewed by transmitted light forms an interlocking image.
Full size (Format-A) machine readable visa (MRV-A)	An MRV conforming with the dimensional specifications contained in Doc 9303, Part 2, sized to completely fill a passport visa page.
Globally Interoperable Biometric	Refers to Face Image as set forth in Doc 9303, Part 3, Volume 2.
Guilloche design	A pattern of continuous fine lines, usually computer generated, and forming a unique image that can only be accurately re-originated by access to the equipment, software and parameters used in creating the original design.
Heat-sealed laminate	A laminate bonded to the MRTD by the application of heat and pressure.
Identification card (ID-card)	A card used as an identity document.
Identity Document	Document used to identify its holder and issuer, which may carry data required as input for the intended use of the document.
Impostor	A person who assumes another person's identity.
Infra-red drop-out ink	An ink which forms a visible image when illuminated with light in the visible part of the spectrum and which cannot be detected when illuminated in the infra-red region.
Intaglio	A printing process used in the production of security documents in which engraved plates, high printing pressure and special inks create a relief design with tactile feel on the surface of the document.
Integrated circuit (IC)	Electronic component designed to perform processing and/or memory functions.
Interoperability	The ability of several independent systems or sub-system components to work together.
Iris (printing)	See Rainbow Printing.
Laminate	A clear material, which may have security features such as optically variable properties, designed to be securely bonded to a document surface.
Laser engraving	A process whereby text and images (usually personalized images) are created by a photo chemical reaction within a substrate using a laser.
Laser-perforation	A process whereby text and/or images are created by perforating the substrate with a laser.
Latent image	A hidden image formed within a relief image which is composed of line structures which vary in direction and profile resulting in the hidden image appearing at predetermined viewing angles.

<b>Term</b>	<b>Definition</b>
Lenticular Feature	Security feature in which a lens structure is integrated in the surface of the document or used as a verification device.
Machine Assisted Document Verification	A process using a device to assist in the verification of the authenticity of the document in respect to data and/or security.
Machine Readable Official Travel Document (MRtd)	A document, usually in the form of a card approximating to ID-1 or ID-2 size that conforms to the specifications of Doc 9303, Part 3, and may be used to cross international borders by agreement between the States involved.
Machine readable passport (MRP)	A passport conforming with the specifications contained in Doc 9303, Part 1, Volume 1.
Machine readable travel document (MRTD)	Official document, conforming with the specifications contained in Doc 9303, issued by a State or organization which is used by the holder for international travel (e.g. passport, visa, MRtd) and which contains mandatory visual (eye readable) data and a separate mandatory data summary in a format which is capable of being read by machine.
Machine readable visa (MRV)	A visa conforming with the specifications contained in Doc 9303, Part 2. The MRV is normally attached to a visa page in a passport.
Machine readable zone (MRZ)	Fixed dimensional area located on the MRTD, containing mandatory and optional data formatted for machine reading using OCR methods.
Machine-verifiable biometric feature	A unique physical personal identification feature (e.g. an iris pattern, fingerprint or facial characteristics) stored on a travel document in a form that can be read and verified by machine.
Metallic ink	Ink exhibiting a metallic-like appearance.
Metameric inks	A pair of inks formulated to appear to be the same colour when viewed under specified conditions, normally daylight illumination, but which do not match under different illumination.
Microprint	Printed text or symbols smaller than 0.25 mm / 0.7 pica points.
Optically Variable Device (OVD)	Security Feature displaying different colours or image appearance depending on viewing angle or verification conditions.
Optically Variable Feature (OVF)	An image or feature whose appearance in colour and/or design changes dependent upon the angle of viewing or illumination.
Optional data capacity expansion technology	Contactless integrated circuit that may be added to a travel document to increase the amount of machine readable data stored in the document. See Doc 9303, Part 3, Volume 2 for guidance on the use of this technology. Bar codes, magnetic stripes and optical memory are also data storage technologies but these are available only for use by a State for its own or bilaterally agreed purposes and are not globally interoperable.
Overlay	An ultra-thin film or protective coating that may be applied to the surface of a document in place of a laminate.



<b>Term</b>	<b>Definition</b>
Passport Card	A td1-sized card which may be issued in place of, or in addition to, a passport book and which one or more receiving States agree to accept as a passport.
Penetrating numbering ink	Ink containing a coloured component, which penetrates deep into a substrate.
Personalization	A process by which biographical data of a certain person are applied to the document.
Phosphorescent ink	Ink containing a material, which glows when exposed to light, the reactive glow remaining visible and then decaying after the light source is removed.
Photochromic ink	An ink that undergoes a reversible colour change when exposed to UV light.
Photo-substitution	A type of forgery in which the portrait in a document is substituted for a different one after the document has been issued.
Physical security	The range of security measures applied within the production environment to prevent theft and unauthorized access to the process.
Planchettes	Small visible/invisible and/or fluorescent platelets incorporated into a document material at the time of its manufacture.
Probe	The biometric template of the enrollee whose identity is sought to be established.
Rainbow printing (Iris or split fountain printing)	A technique whereby two or more colours of ink are printed simultaneously by the same unit on a press to create a controlled merging of the colours similar to the effect seen in a rainbow.
Reactive inks	Inks that contain chemical sensitizers to guard against tampering.
Receiving State	The country to which the MRTD holder is applying for entry.
Relief (3-D) design (Medallion)	A security background design incorporating an image generated in such a way as to create the illusion that it is embossed or debossed on the substrate surface.
Secondary image	A repeat image of the holder's portrait reproduced elsewhere in the document by whatever means.
Security thread	A thin strip of plastic or other material embedded or partially embedded in the structure of the document.
See-through register (front-to-back)	See front-to-back register.
Shadow Image	Used synonym to Ghost Image: A second representation of the holder's portrait on the document, reduced in contrast and/or saturation and/or size.
Size 1 machine readable official travel document (td1)	A card with nominal dimensions guided by those specified for the ID-1 type card (ISO/IEC 7810) (excluding thickness).
Size 2 machine readable official travel document (td2)	A card or label conforming with the dimensions defined for the ID-2 type card (ISO/IEC 7810) (excluding thickness).

<b>Term</b>	<b>Definition</b>
Small size (Format-B) machine readable visa (MRV-B)	An MRV conforming with the dimensional specifications (ID-2 size) contained in Doc 9303, Part 2, sized to maintain a clear area on the passport visa page.
Steganography	A technique which applies concealed data into the MRTD for the purpose of authentication of the document by machine or visual aid.
Structure feature	A structure feature involves the incorporation of a measurable structure into or onto the MRTD. The presence of the structure may be detected and measured by the detection machine.
Substance feature	A substance feature involves the incorporation into the MRTD of a material which would not normally be present and is not obviously present on visual inspection. The presence of the material may be detected by the presence and magnitude of a suitable property of the added substance.
Tactile feature	A surface feature giving a distinctive texture to the document.
Tagged ink	Inks containing compounds that are not naturally occurring substances in an MRTD and which can be detected using special equipment.
Tamper resistance	The capability of components within a document to withstand alteration.
Thermochromic ink	An ink which undergoes a reversible colour change when the printed image is exposed to a specific change in temperature.
UV dull substrate	A substrate that exhibits no visibly detectable fluorescence when illuminated with UV radiation.
Variable laser image	Feature generated by laser engraving or laser perforation displaying changing information or images dependent upon the viewing angle.
Visual inspection zone (VIZ)	Those portions of the MRTD (data page in the case of MRP) designed for visual inspection, i.e. front and back (where applicable), not defined as the MRZ.
Watermark	A design, typically containing tonal gradation, formed in the paper or other substrate during its manufacture, created by the displacement of materials therein, viewable by transmitted light.
Zone	An area containing a logical grouping of data elements on the MRTD. Seven (7) zones are defined for MRTDs.

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## I. INTRODUCTION

ICAO's work on machine readable travel documents began in 1968 with the establishment, by the Air Transport Committee of the Council, of a Panel on Passport Cards. This Panel was charged with developing recommendations for a standardized passport book or card that would be machine readable, in the interest of accelerating the clearance of passengers through passport controls. The Panel produced a number of recommendations, including the adoption of optical character reading (OCR) as the machine reading technology of choice due to its maturity, cost-effectiveness and reliability. In 1980, the specifications and guidance material developed by the Panel were published as the first edition of Doc 9303, titled *A Passport with Machine Readable Capability*, which became the basis for the initial issuance of machine readable passports by Australia, Canada and the United States.

In 1984, ICAO established what is now known as the Technical Advisory Group on Machine Readable Travel Documents (TAG/MRTD), comprised of government officials who specialize in the issuance and border inspection of passports and other travel documents, in order to update and enhance the specifications which had been prepared by the Panel. Subsequently, this group's terms of reference were expanded to include, first, the development of specifications for a machine readable visa and, later, specifications for machine readable cards that may be used as official travel documents. Doc 9303 is now published in separate parts, one for each type of document.

In 1998, the New Technologies Working Group of the TAG/MRTD began work to establish the most effective biometric identification system and associated means of data storage for use in MRTD applications, particularly in relation to document issuance and immigration considerations. The bulk of the work had been completed by the time the events of 11 September 2001 caused States to attach greater importance to the security of a travel document and the identification of its holder. The work was quickly finalized and endorsed by the TAG/MRTD and the Air Transport Committee. The results were published, in September 2006, as a standard in Volume 2 of the sixth edition of Doc 9303, Part 1.

The documents specified in Doc 9303, Part 3 are designed for use as alternatives to a passport book to enable the holder to cross international borders. This third edition, therefore, updates and modifies the specifications for machine readable official travel documents similar to the standard found for the passport book in the sixth edition of Doc 9303, Part 1.

## GENERAL CONSIDERATIONS

### ICAO's leadership role

ICAO's initiative to develop standard specifications for passports and other travel documents followed the tradition established by the League of Nations Passport Conferences of the 1920s and the work of the League's successor, the United Nations Organization. ICAO's mandate to continue in its leadership role stems from the Convention on International Civil Aviation (the "Chicago Convention") which covers the full range of requirements for efficient and orderly civil aviation operations, including provisions for clearance of persons through border controls, i.e.:

- a) the requirement for persons travelling by air and aircraft crews to comply with immigration, customs and passport regulations (Article 13);

- b) the requirement for States to facilitate border clearance formalities and prevent unnecessary delays (Article 22);
- c) the requirement that States collaborate in these matters (Article 23); and
- d) the requirement for States to develop and adopt internationally standard procedures for immigration and customs clearance (Article 37 (j)).

Under this mandate, ICAO develops and maintains international Standards in Annex 9 — *Facilitation* to the Chicago Convention for implementation by Contracting States. In the development of such Standards, it is a fundamental precept that if public authorities are to facilitate inspection formalities for the vast majority of air travellers, those authorities must have a satisfactory level of confidence in the reliability of travel documents and in the effectiveness of inspection procedures. The production of standardized specifications for travel documents and the data contained therein is aimed at building that confidence.

In 2004, the Assembly of ICAO affirmed that cooperative work on specifications to strengthen the security and integrity of travel documents should be pursued by the Organization as a matter of high priority. In addition to the International Organization for Standardization (ISO), consultants to the TAG/MRTD include the International Air Transport Association (IATA), the Airports Council International (ACI), and the International Criminal Police Organization (INTERPOL).

### **Relative costs and benefits of machine readable travel documents**

Experience with the issuance of machine readable passports, in conformity with the specifications set forth in Doc 9303, Part 1, indicates that the cost of producing MRTDs may be no greater than that of producing conventional documents, though the cost will be higher when biometric identification and electronic on-document data storage are implemented. As traffic volumes grow and more States focus on how they can rationalize their clearance processes with the employment of computerized databases and electronic data interchange, the MRTD plays a pivotal part in modern, enhanced compliance systems. Equipment to read the documents and access the databases may entail a substantial investment, but this can be expected to be returned by the improvements in security, clearance speed and accuracy of verification which such systems provide. Use of MRTDs in automated clearance systems may also make it possible for States to eliminate both the requirement for paper documents, such as passenger manifests and embarkation/disembarkation cards, and the administrative costs associated with the related manual procedures.

### **Operations**

The basic machine readable travel document, with its OCR medium, is designed for both visual and mechanical reading. This feature is essential, since the conversion of travel documents to machine readable format can only be made gradually as current travel documents expire and are renewed or reissued, and the introduction of machine readability at border-crossing points is only being introduced gradually according to traffic volumes. This third edition of Doc 9303, Part 3, specifies one additional machine reading technology for future global interoperability which is to be introduced on an optional basis in the various travel documents; however in documents so enhanced, the OCR will be retained as the basic technology, considered mandatory to ensure global interoperability.

ICAO member States have recognized that standardization is a necessity and that the benefits of adopting the Doc 9303 standard formats for passports and other travel documents extend beyond the obvious advantages for States that have the machine readers and databases for use in automated clearance systems. In fact, the

physical characteristics and data security features of the documents themselves offer strong defense against alteration, forgery or counterfeit. Moreover, adoption of the standardized format for the visual zone of an MRTD facilitates inspection by airline and government officials, with the result that clearance of low-risk traffic is expedited, problem cases are more readily identified, and enforcement is improved. The optional introduction of biometric identification with data stored on a contactless integrated circuit will provide greater security and resistance to fraud and thus make it easier for the legitimate document holder to obtain visas for travel and to be processed through border inspection systems.

### **Endorsement by ISO**

The technical specifications sections of Doc 9303, Parts 1, 2 and 3 have received the endorsement of the International Organization for Standardization as ISO Standards 7501-1, 7501-2, and 7501-3, respectively. Such endorsement is made possible by means of a liaison mechanism through which manufacturers of travel documents, readers and other technologies provide technical and engineering advice to the TAG/MRTD under the auspices of ISO. Through this working relationship, the ICAO specifications have achieved, and are expected to continue to receive, the status of worldwide standards by means of a simplified procedure within ISO.

The liaison mechanism with ISO has been successfully applied not only to the endorsement of new specifications for travel documents as ISO standards but also to the approval of amendments to the specifications. Subsequent revisions to Doc 9303, Parts 1, 2 and 3, will therefore be processed for ISO endorsement in the same manner as previously.

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## II. TECHNICAL SPECIFICATIONS FOR MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS — REFERENCES

### Scope

1. Doc 9303, Part 3, Volume 1 defines the specifications for two sizes of machine readable official travel documents (MRtds), providing for global data interchange using both visual (eye readable) and machine readable (optical character recognition) means. The specifications lay down standards for identity documents that can, where issued by a State or organization and accepted by a receiving State, be used for cross-border travel purposes. The MRtds shall, as a minimum, contain the mandatory data specified in this volume, in the prescribed standard format. This volume also includes specifications for the mandatory and discretionary incorporation of security features. The specifications of Part 3 may be used by a State or organization for the issuance of a machine readable passport in the form of a Size 1 card. The combined specifications of this volume and of Volume 2 of Part 3 permit the discretionary incorporation of additional electronic data storage to supplement the machine readable zone, principally to allow for an encoded biometric for identity confirmation of the MRP holder.

### Note on Supplement

2. ICAO will issue from time-to-time a “Supplement to Doc 9303.” The Supplement will contain information intended to clarify, amplify or elaborate on issues with respect to travel document standards, as well as to correct errors encountered from implementation experiences. It is intended that the information contained in the Supplement will augment the existing guidance in Doc 9303 as well as in Technical Reports issued by ICAO. The Supplement will be issued on a continuing and consistent basis.

The specifications of Doc 9303 should always be read in conjunction with the additional information set out in the latest release of the Supplement which will be available on the ICAO web site at [www.icao.int/mrtd](http://www.icao.int/mrtd).

### Normative references

3. Certain provisions of the following International Standards, referenced in this text, constitute provisions of Part 3 of Doc 9303. Where differences exist between the specifications contained in Part 3 and the referenced Standards, to accommodate specific construction requirements for machine readable official travel documents, the specifications contained herein shall prevail.

ISO 1073-2:	1976	<i>Alphanumeric character sets for optical character recognition — Part 2: Character set OCR-B — Shapes and dimensions of the printed image</i>
ISO 1831:	1980	<i>Printing specifications for optical character recognition</i>
ISO 3166-1:	2006	<i>Codes for the representation of names of countries and their subdivisions — Part 1: Country codes</i>
ISO/IEC 7810:	2003	<i>Identification cards — Physical characteristics</i>

ISO/IEC 7816-2: 2007 *Identification cards — Integrated circuit cards — Part 2: Cards with contacts — Dimensions and location of the contacts*

ISO 8601: 2004 *Data elements and interchange formats — Information interchange — Representation of dates and times.*

*Note.— The date indicates the most recent edition of the Standard at the time of publishing. Hereinafter, this document will cite the ISO Standards only, without reference to the year.*

*General Note.— The decimal notation used in these specifications conforms to ICAO practice. The ISO practice is to use a decimal point (.) in imperial measurements and a comma (,) in metric measurements.*

### **Technical specifications for machine readable official travel documents**

4. Technical specifications for non-electronically enabled machine readable travel documents (td1 or td2) are presented in four sections as follows:

- Section III — Technical specifications for the security to be incorporated into the MRtd at its time of manufacture and of personalization, together with specifications for the security of the facilities in which such operations are carried out in addition to secure methods of auditing and issuance.
- Section IV — Technical specifications applicable to both sizes of machine readable official travel documents.
- Section V — Additional technical specifications applicable to the smaller size of machine readable official travel document (td1).
- Section VI — Additional technical specifications applicable to the larger size of machine readable official travel document (td2).

Sections III to VI contain Appendices that form part of the specifications of Doc 9303, Part 3. If an Appendix is “Normative”, compliance with its content is mandatory. If an Appendix is “Informative”, the contents are provided for information or as a recommendation of good practice without being mandatory.

A separate Volume 2 of Part 3 of Doc 9303 contains the additional specifications necessary for a State to issue a globally interoperable, electronically enabled machine readable official document of identity, incorporating biometric identification.

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### **III. TECHNICAL SPECIFICATIONS FOR THE SECURITY OF THE DESIGN, MANUFACTURE AND ISSUANCE OF MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS**

#### **Scope**

1. This section provides mandatory and optional specifications for the precautions to be taken by an issuing State to ensure that its MRtd, and the MRtd's means of personalization to its rightful holder, are secure against fraudulent attack. Mandatory and optional specifications are also provided for the physical security to be provided at the premises where the MRtd is produced and personalized and for the vetting of personnel involved in these operations.

#### **Security of the MRtd and its personalization**

2. The MRtd, and its method of personalization, shall be designed to incorporate safeguards to protect the document against fraudulent attack during its validity period. Methods of fraudulent attack can be classified as follows:

2.1 *Counterfeit* involves the creation of all or part of a document which resembles the genuine MRtd with the intention that it be used as if it were genuine. Counterfeits may be produced by attempting to duplicate or simulate the genuine method of manufacture and the materials used therein or by using copying techniques.

2.2 *Fraudulent alteration, also known as forgery*, involves the alteration of a genuine document in an attempt to enable it to be used for travel by an unauthorized person or to an unauthorized destination. The biographical details of the genuine holder, particularly the portrait, form the prime target for such alteration.

2.3 There are established methods of providing security against both types of fraudulent attack. These involve the use of materials which are not readily available, combined with highly specialized design systems and manufacturing processes requiring special equipment and expertise. Appendix 1 to this Section lists some of the techniques currently known to be available to provide security to an MRtd enabling an inspecting officer to detect a counterfeit or fraudulently altered document either visually or with the aid of simple equipment such as a magnifying glass or ultraviolet lamp.

2.4 All MRtds that conform to Doc 9303, Part 3 shall use the specified Basic Security Features listed in Table III-1 of Appendix 1.

#### **Machine assisted document verification**

3. An issuing State may wish to incorporate into its MRtd one or more security features which require the use of detection equipment to detect and verify their presence within the normal time for immigration clearance. Such features are of three types as described in 3.1 to 3.3. Doc 9303, Part 3, does not specify any feature as a means of globally interoperable machine assisted document verification, as the use of a single feature worldwide would make the feature highly vulnerable to fraudulent attack. The features may vary in size from less than 1 mm (0.04 in) square up to the whole area of the document. Where the area occupied is less



than the area of the MRtd, this document recommends (in Appendix 2 to Section III) preferred locations for two of the three types of feature. States are therefore free to select none or one or more machine verifiable features to assist in document verification but such feature(s) will be for their own or agreed bilateral use.

3.1 *Substance features.* A substance feature involves the incorporation into the MRtd of a material which would not normally be present and is not obviously present on visual inspection. The presence of the material may be detected by the presence and magnitude of a suitable property of the added substance. Appendix 2 to this Section provides details of some available substances.

3.2 *Structure features.* A structure feature involves the incorporation of a measurable structure into or onto the MRtd data page. The presence of the structure may be detected and measured by the detection machine. Appendix 2 gives details of some currently available structures.

3.3 *Data features.* A data feature involves the incorporation of encoded information into the document data or image structure, usually into the personalization data, especially the portrait. The term steganography, in this context, describes a special class of data features typically taking the form of digital information which is concealed within an image, usually either the personalization portrait or the background security printing. The concealed image may be made visible by the use of a suitable device which could be built into a document reader. The concealed image may contain data such as the holder's name or document number which may be read by the immigration officer using the detector. In more complex forms the amount of stored data can be significant, and this can be verified by electronic comparison with data stored in the contactless integrated circuit. Appendix 2 gives details of some currently available techniques.

#### **Security of MRtd production and issuance facilities**

4. The State issuing the MRtd shall ensure that the premises in which the MRtd is printed, bound, personalized and issued are appropriately secure and that staff employed therein have an appropriate security clearance. Appropriate security shall also be provided for MRtds in transit between facilities and from the facility to the MRtd's holder. Appendix 3 to this Section provides recommendations as to how these requirements can be met.

#### **Provision of information on newly issued MRtds**

5. It is recommended that a State launching a new design of MRtd inform all other States of the details of the new MRtd including evident security features, preferably providing personalized specimens for use as a reference by the receiving State's department which is responsible for verifying the authenticity of such documents. The distribution of such specimens should be made to established contact points agreed by the receiving States.

#### **Provision of information on lost and stolen MRtds**

6. States should provide specific information on lost or stolen MRtds, such as the MRtd document number, to the central database operated by INTERPOL at the appropriate time and according to agreed procedures. This includes details of any unpersonalized MRtds which may be stolen from a production or issuance facility or in transit.

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## **INFORMATIVE APPENDIX 1 to Section III**

### **SECURITY STANDARDS FOR MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS**

#### **1. Scope**

1.1 This Appendix contains minimum specifications for strengthening the security of size 1 and size 2 machine readable official travel documents. It also provides guidance on methods of enhancing the level of security above the specified minimum. The recommendations cover the security of the materials used in the document's construction, the security printing and copy protection techniques to be employed, and the processes used in the production of document blanks. Also addressed are the security considerations that apply to the imaging and finishing processes involved in personalization and the protection of the biographical data in the document. Those States not yet issuing machine readable travel documents shall also consider this Appendix.

#### **2. Introduction**

2.1 Historically, Doc 9303 has not made recommendations on the specific security features to be incorporated in travel documents. Each issuing State has been free to incorporate such safeguards as it deemed appropriate to protect its nationally issued travel documents against counterfeiting, forgery and other forms of attack, as long as nothing was included which would adversely affect their OCR machine readability.

2.2 The growth in international crime and illegal immigration has led to increasing concerns over the security of travel documents and calls for recommendations on what may be done to help improve their resistance to attack or misuse.

2.3 To meet this need, ICAO's technical advisors decided it would be desirable to publish a set of "recommended minimum security standards" as a guideline for all States issuing machine readable travel documents. In addition to the minimum standards, recommendations were to be made on optional techniques that can increase protection against fraud. This Appendix describes security measures to be taken within the structure of the MRtd and of the premises in which it is produced. Appendix 2 describes the security measures to be taken to ensure the security of the personalization operations and of the documents in transit. Appendix 3 describes optional means of achieving machine-assisted document verification.

2.4 This Appendix identifies the security threats to which travel documents are frequently exposed and the counter-measures that may be employed to protect these documents and their associated personalization systems. The lists of security features and/or techniques offering protection against these threats have been subdivided into: 1) basic security features and/or techniques considered essential and; 2) additional features and/or techniques from which States are encouraged to select items which are recommended for providing an enhanced level of security. This approach recognizes that a feature or technique that may be necessary to protect one State's documents may be superfluous or of minor importance to another State using different production systems. A targeted approach that allows States flexibility to choose from different document systems (paper-based documents, plastic cards, etc.) and a combination of security features and/or techniques most appropriate to their particular needs is therefore preferred to a "one size fits all" philosophy. However, to help ensure that a balanced set of security features and/or techniques is chosen, it is necessary for each State

to conduct a risk assessment of its national travel documents to identify their most vulnerable aspects and select the additional features and/or techniques that best address these specific problems.

2.5 The aim of the recommendations in this Appendix is to improve the security of machine readable travel documents worldwide by establishing a baseline for issuing States. Nothing within these recommendations shall prevent or hinder States from implementing additional, more advanced security features, at their discretion, to achieve a standard of security superior to the minimum recommended features and techniques set forth in this Appendix.

2.6 A summary table of typical security threats relating to travel documents and some of the security features and techniques that can help to protect against these threats is included.

2.7 A glossary of technical terms appears at the beginning of this document.

### 3. Basic principles

3.1 Production of MRtds, including the personalization processes, should be undertaken in a secure, controlled environment with appropriate security measures in place to protect the premises against unauthorized access. If the personalization process is decentralized, or if personalization is carried out in a location geographically separated from where the travel document blanks are made, appropriate precautions should be taken when transporting the blank documents and any associated security materials to safeguard their security in transit.

3.2 There should be full accountability over all the security materials used in the production of good and spoiled travel documents and a full reconciliation at each stage of the production process with records maintained to account for all material usage. The audit trail should be to a sufficient level of detail to account for every unit of material used in the production and should be independently audited by persons who are not directly involved in the production. Certified records should be kept of the destruction of all security waste material and spoiled documents.

3.3 Materials used in the production of travel documents should be of controlled varieties and obtained only from bona fide security materials suppliers. Materials whose use is restricted to high security applications should be used, and materials that are available to the public on the open market should be avoided.

3.4 Sole dependence upon the use of publicly available graphics design software packages for originating the security backgrounds should be avoided. These software packages may however be used in conjunction with specialist security design software.

3.5 Security features and/or techniques should be included in travel documents to protect against unauthorized reproduction, alteration and other forms of tampering. In addition to those features included to protect blank documents from counterfeiting and forgery, special attention must be given to protect the biographical data from removal or alteration. A travel document should include adequate security features and/or techniques to make evident any attempt to tamper with it.

3.6 The combination of security features, materials and techniques must be well chosen to ensure full compatibility and protection for the lifetime of the document.

3.7 Although this Appendix deals mainly with security features that help to protect travel documents from counterfeiting and fraudulent alteration, there is another class of security features comprised of covert (secret) features, designed to be authenticated either by forensic examination or by specialist verification equipment. It is evident that knowledge of the precise substance and structure of such features should be

restricted to very few people on a "need to know" basis. The purpose of these features is not to prevent counterfeiting but to enable authentication of documents where unequivocal proof of authenticity is a requirement (e.g. in a court of law). All travel documents should contain at least one covert security feature as a basic feature.

#### **4. Main threats to the security of travel documents**

4.1 The following threats to document security, listed in no particular order of importance, are identified ways in which the document, its issuance and use may be fraudulently attacked:

- Counterfeiting a complete travel document
- Photo-substitution
- Deletion/alteration of text in the visual or machine readable zone of the MRtd
- Construction of a fraudulent document, or parts thereof, using materials from legitimate documents
- Theft of genuine document blanks
- Impostors (assumed identity using a genuine MRtd).

4.2 To provide protection against these threats and others, a travel document requires a range of security features and techniques combined in an appropriate way within the document. Although some features can offer protection against more than one type of threat, no single feature can offer protection against them all. Likewise, no security feature is 100 per cent effective in eliminating any one category of threat. The best protection is obtained from a balanced set of features and techniques providing multiple layers of security in the document that combine to deter or defeat fraudulent attack.

#### **5. Security features and techniques**

In the sections that follow, security features, techniques and other security measures are categorized according to the phases passed through during the production and personalization processes and the components of the travel document created thereby with regard to: 1) substrate materials; 2) security printing; 3) protection against copying; and 4) personalization techniques. Issuing States are recommended to incorporate all of the basic features/measures and to select a number of additional features/measures from the list having first completed a full risk assessment of their travel documents. Unless otherwise indicated, the security features may be assumed to apply to all parts of a travel document. Care must be taken to ensure that features do not interfere with the machine readability of the travel document.

##### **5.1 Materials forming the td1 or td2**

5.1.1 *Plastic and/or paper may be involved in the construction of a td1 or td2*

###### *Basic features*

- Plastic or paper involved in the construction of the card shall be UV dull or with a controlled response to UV, such that when illuminated by UV light it exhibits a fluorescence distinguishable in colour from the blue used in commonly available fluorescent materials;

- If the core substance is paper it is desirable that it contains a watermark comprising two or more grey levels, preferably in register with printed design.

#### *Additional features*

- invisible fluorescent fibres and/or planchettes in core or laminate;
- visible (fluorescent) fibres and/or planchettes<sup>1</sup>;
- security thread included in the card construction. The thread may incorporate special effects such as thermochromic, photochromic, optically variable or magnetic properties<sup>1</sup>;
- tactile feature on card outer surface.

*Note.* — Where the core substrate used for the MRtd is formed entirely of plastic, it is usually not possible to incorporate the security components normally available in a paper substrate. In such cases additional security properties shall be included, including additional security printed features, enhanced personalization techniques and/or the use of optically variable features.

## **5.2 Security printing**

### 5.2.1 *Background and text printing*

#### *Basic features*

- two-colour guilloche security background design pattern<sup>2</sup>;
- rainbow printing;
- anti-scan pattern;
- microprinted text.

#### *Additional features*

- duplex security pattern;
- relief (3-D) design feature;
- deliberate error (e.g. spelling) incorporated within microprint.

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1. The use of these features must not interfere with machine readability of the document in the B-900 band of the spectrum or with the legibility of the portrait, signature or other biographical data in the visual zone.

2. Where the guilloche pattern has been computer-generated, the image reproduced on the document must be such that no evidence of a pixel structure shall be detectable. Guilloches may be displayed as positive images, where the image lines appear printed with white spaces between them, or as negative images, where the image lines appear in white, with the spaces between them printed. A two-colour guilloche is a design that incorporates guilloche patterns created by superimposing two elements of the guilloche, reproduced in contrasting colours.

## 5.2.2 Inks

### *Basic features*

- UV fluorescent ink (visible and/or invisible) on both sides of the document.

### *Additional features*

- inks with optically variable properties;
- metallic inks;
- metamerism inks;
- infrared drop-out inks;
- thermochromic inks;
- photochromic inks;
- infrared fluorescent inks;
- phosphorescent inks;
- tagged inks.

## 5.2.3 Numbering

A number unique to the document shall appear on the biographical data face of an MRtd. The number is preferably incorporated at the time of manufacture of the card but can alternatively be incorporated at a later stage using the same technique as is used for applying the biographical data. The latter option is less secure as the document is not identifiable until it is personalized.

## 5.2.4 *Special security measures for use with plastic cards*

Where a travel document is constructed entirely of plastic, optically variable security features shall be employed which give a changing appearance with angle of viewing. Such devices may take the form of latent images, lenticular features, colour-shifting ink, or diffractive optically variable image features.

## **5.3 Protection against copying**

### 5.3.1 *Need for anticopy protection*

- The current state of development of generally available digital reproduction techniques and the resulting potential for fraud means that high-grade security features in the form of optically variable features or other equivalent devices will be required as safeguards against copying and scanning. Emphasis should be placed on the security of the biographical data page, based on an independent, complex optically variable feature technology or other equivalent devices complementing other security techniques.

- Appropriate integration of optically variable feature components or other equivalent devices into the layered structure of the biographical data page should also protect the data from fraudulent alteration. The optically variable components and all associated security materials used to create the layered structure must also be protected against counterfeiting.

#### 5.3.2 *Anticopy protection methods*

- Subject to the minimum recommendations described in 5.4.3 and 5.4.4 on the need for lamination, optically variable features should be used on the biographical data side of a td1 or td2 as a *basic feature*.
- Whether protected by a laminate film or overlay or not, one or more optically variable features (preferably based on diffractive structure) should be integrated into the structure of the MRtd, especially into the laminate film or overlay, if one is used. Such a feature should not affect the legibility of the entered data. The inclusion of a diffractive optically variable feature is recommended to achieve an enhanced level of protection against reproduction.
- Devices offering equivalent protection may be used in place of an optically variable feature.

### 5.4 *Personalization technique*

#### 5.4.1 *Document personalization*

This is the process by which the portrait, signature and/or other biographical data relating to the holder of the document are applied to the travel document. These data record the personalized details of the holder and are at the greatest risk of fraudulent alteration. One of the most frequent types of document fraud involves the removal of the portrait image from a stolen or illegally obtained travel document and its replacement with the portrait of a different person. Documents with stick-in portrait photographs are particularly susceptible to photo substitution. Therefore, this method is not recommended.

#### 5.4.2 *Protection against alteration*

To ensure that data are properly secured against attempts at forgery, it is necessary to integrate the biographical data, including the portrait, signature and main issue data, into the basic material of the document. A variety of technologies are available for imaging the document in this way, including the following, which are listed in no particular order of importance:

- electro-photographic printing (e.g. laser printing);
- thermal transfer printing;
- ink-jet printing;
- photographic processes;
- laser engraving.

It is recommended that any standard equipment used to print personalization data be altered so that it produces one or more unique features in the document that are not available to the general public (for example, broken face type), or that materials used with the equipment, such as inks, are uniquely designed so as to be readily identifiable as a product of that process only.

#### 5.4.3 Choice of document system

The choice of a particular technology is a matter for individual issuing States and will depend upon a number of factors, such as the volume of travel documents to be produced, the construction of the document and whether it is to be personalized during the document-making process or after the MRtd has been assembled. Whichever method is chosen, it is essential that precautions be taken to protect the personalized details against tampering, for example, by use of security laminates or overlays or by ensuring that the personalization image is embedded in the substrate.

#### 5.4.4 Protection against photo substitution and alteration of data on a td1 or td2

##### *Basic features*

- imaging the portrait and all biographical data by integration into the structure of the MRtd;
- security background guilloche or other security printed features overlapping the portrait area;
- firmly affixed or tamper-evident laminate or overlay or a combination of imaging technology and document structure that provides an equivalent resistance to substitution of the portrait and other biographical data.

##### *Additional features*

- an optically variable feature superimposed on (but not rendering illegible) the portrait;
- steganographic features incorporated in the document;
- secondary portrait image of holder (printed and/or perforated);
- duplicate information in a machine readable form in an optional data capacity expansion technology (i.e. contactless integrated circuit);
- machine verifiable biometric feature.

## **6. Document issuance and inspection procedures**

6.1 This section relates to the processes whereby a State determines the entitlement of an individual to be issued a travel document and the immigration and border controls that are applied to check the document and validate the identity of the person presenting it. Although these are not strictly document security issues they are fundamental to the overall security of the document system and so have been included for the sake of completeness. In section 4 of this Appendix these threats are characterized as the threats posed by impostors. In this context, an impostor is a person who assumes a false identity to obtain a travel document in someone else's name or who uses another person's document and alters his own appearance in order to impersonate that other person. These are uniquely troublesome problems, because both cases involve the fraudulent use of genuine documents rather than counterfeit or forged documents. Prevention and detection of this type of fraud can be difficult, requiring different security measures and checks than are used to protect and determine the authenticity of a document. The following measures shall be adopted:



### *Basic measures*

- original portrait photographs and all digitally captured portrait images to be true likenesses of the legitimate holder, and the image to be of the appropriate dimensions as specified in Appendix 5 to Section IV.
- reproductions of the portrait and the holder's signature to be true likenesses of the original and if the signature is reduced in scale to fit the size of the field in the biographical data, the image so reproduced shall be no less than 50 per cent of the original as specified in Section V, paragraph 3.3 (td1) and Section VI, paragraph 3.3 (td2).
- training of Border Inspection Officers in detection techniques.
- thorough checking and cross-referencing of supporting identity documents prior to issuing a travel document.
- maintained database of all documents issued nationally along with search and match capability, where permitted by national legislation.
- maintained database of all lost, stolen, defective or other security-sensitive documents or materials along with search and match capability.

### *Optional additional measures*

- inclusion of a machine verifiable biometric feature linking the document to its legitimate holder.
- bilateral and multilateral agreements between States to share information on suspect travellers/documents, where permitted by national legislation.
- full audit trail recording the document applicant's identity.
- records interrogation capability at 'ports of entry' with access to application form, photo and supporting identity documents, where permitted.

## **6.2 Other security-related issues**

In addition to the security features identified above, the following factors related to the production and configuration of the travel document also contribute to the overall security of the document. This section of the Appendix aims to give guidance to States on these issues.

### **6.2.1 Protection against theft and abuse of genuine document blanks or document components**

The most effective method of protecting against the illegal issue of stolen blank travel documents is to centralize the issuance process. Where travel documents continue to be issued on a regional or decentralized basis, appropriate security measures should be taken in terms of logistics, administration and personalization techniques. This applies particularly to the storage of blank documents and the means of personalization (e.g. access to personalization systems). Blank documents should be stored in locked and appropriately supervised premises. The following measures should be adopted:

#### *Basic measures*

- good physical security of the premises with controlled access to delivery/shipment and production areas, document storage facilities and personalization equipment;
- full audit trail, with counting and reconciliation of all materials (used, unused, defective or spoiled) and certified records of same;
- all document blanks and other security-sensitive components serially numbered with full audit trail for every document from manufacture to dispatch;
- where applicable, tracking and control numbers of other principal document components (e.g. rolls or sheets of laminates, optically variable feature devices);
- secure transport vehicles for movement of blank MRtds and other principal document components (if applicable);
- details of all lost and stolen travel document blanks to be rapidly circulated between governments;
- appropriate controls to be in place to protect the production, personalization and issuance systems from internal fraud.

#### *Additional measures*

- CCTV coverage/recording of all production areas, where permitted;
- centralized production, personalization and issuing of documents;
- computerized systems can also be used to authenticate document issue, for example, by affixing digital security devices including steganographic features.

#### 6.2.2 *Internal security of the issuance process*

Appropriate controls must be in place to protect the internal security of the issuance process to prevent fraudulent use of the system by employees and other persons who may obtain access to all or any part of the official issuance system.

#### *Basic features*

- the handling and storage of application data and forms shall be done using relevant security arrangements so that the integrity of the data can be guaranteed through the issuance process and to ensure any archived/stored information cannot be changed.
- if possible, when making issuance decisions, the relevant national or municipal registers and databases shall be deployed for proper identification.
- the issuance process shall be organized in such a manner that no one individual can authorize the issuance of, personalize, and issue a travel document.
- there shall be a complete audit trail of the entire issuance and personalization processes and when handling forms and user data, or making database transactions, the person(s) carrying out these operations shall sign or identify themselves to link them with the action.

- the integrity of audit trail data shall be protected through proper means (user rights or encryption, etc.).

#### *Additional features*

- strict control of the issuance of the personalized travel document to the applicant with proper identification of the applicant both at the time of application for, and at the time of receipt of, the travel document.
- control of the staffing arrangements to reduce the possibility of fraud through complicity of employees in the application and document handling processes.
- centralization of the personalization processes.
- procedures to restrict access to the computer equipment used for personalization particularly the use of biometric logon tools.

### **7. Quality control**

Quality checks and controls at all stages of the production process and from one batch to the next are essential to maintain consistency in the finished travel document. This should include quality assurance checks on all materials used in the manufacture of the documents and the readability of the machine readable lines. The importance of consistency in the finished travel document is paramount because immigration inspectors and border control officers rely upon being able to recognize fake documents from variations in their appearance or characteristics. If there are variations in the quality, appearance or characteristics of a State's genuine travel documents, detection of counterfeit or forged documents is made more difficult.

**Table III-1. Summary of security recommendations**

Threats	Basic features	Additional features
<b>Counterfeiting/Copying</b>		
Paper substrates	<ul style="list-style-type: none"> <li>— controlled UV response</li> <li>— two-tone watermark</li> </ul>	<ul style="list-style-type: none"> <li>— registered watermark</li> <li>— invisible UV fibres/ planchettes</li> <li>— visible UV fibres/planchettes</li> <li>— embedded or window thread</li> </ul>
Plastic/synthetic substrates	<ul style="list-style-type: none"> <li>— as per paper or substitute</li> <li>— security features providing an equivalent level of security in plastic</li> </ul>	<ul style="list-style-type: none"> <li>— optically variable feature(OVF)</li> </ul>

**Table III-1. Summary of security recommendations**

Threats	Basic features	Additional features
Security printing	<ul style="list-style-type: none"> <li>– two-colour guilloche background</li> <li>– rainbow printing</li> <li>– anti-scan pattern</li> <li>– microprinting</li> </ul>	<ul style="list-style-type: none"> <li>– intaglio printing (<i>not normally possible on a td1 or td2</i>)</li> <li>– latent image</li> <li>– duplex pattern</li> <li>– 3-D design feature</li> <li>– front-to-back register feature</li> <li>– deliberate error in microprint</li> <li>– tactile feature</li> </ul>
Numbering	<ul style="list-style-type: none"> <li>– unique document number</li> </ul>	<ul style="list-style-type: none"> <li>– perforated document number</li> <li>– special typefonts</li> </ul>
Inks	<ul style="list-style-type: none"> <li>– UV inks</li> </ul>	<ul style="list-style-type: none"> <li>– optically variable properties</li> <li>– metallic inks</li> <li>– penetrating numbering ink</li> <li>– metameric inks</li> <li>– infrared dropout ink</li> <li>– thermochromic ink</li> <li>– photochromic ink</li> <li>– infrared fluorescent ink</li> <li>– phosphorescent ink</li> <li>– tagged ink</li> </ul>
Photo-substitution	<ul style="list-style-type: none"> <li>– personalization integrated into the structure of the MRtd</li> <li>– guilloche or other security printed feature overlapping portrait</li> <li>– secure laminate or overlay or equivalent</li> </ul>	<ul style="list-style-type: none"> <li>– OVF over the portrait</li> <li>– embedded image</li> <li>– secondary portrait image</li> <li>– storage and retrieval system for digital portrait images</li> <li>– biometric feature</li> </ul>
Alteration of the biodata	<ul style="list-style-type: none"> <li>– secure personalization technique</li> <li>– secure laminate or overlay or equivalent</li> </ul>	<ul style="list-style-type: none"> <li>– secondary biodata image</li> <li>– OVF over the biodata</li> </ul>
Falsely obtained documents	<ul style="list-style-type: none"> <li>– good-quality captured images</li> <li>– good-quality reproduction images</li> <li>– training of inspection staff</li> <li>– checks of supporting identity documents</li> <li>– records search capability</li> <li>– register of lost and stolen documents</li> </ul>	<ul style="list-style-type: none"> <li>– biometric identifier</li> <li>– international cooperation</li> <li>– audit trail for identity checks</li> <li>– records of interrogation system</li> <li>– national ID database</li> </ul>

**Table III-1. Summary of security recommendations**

Threats	Basic features	Additional features
Document theft	<ul style="list-style-type: none"> <li>– good physical security arrangements</li> <li>– control of all security components</li> <li>– serial numbers on blank documents</li> <li>– secure transport of blank documents</li> <li>– internal fraud protection system</li> <li>– international exchange on lost and stolen documents</li> </ul>	<ul style="list-style-type: none"> <li>– CCTV in production areas</li> <li>– centralized production</li> <li>– embedded image</li> </ul>

*Notes.–*

1. *Issuing States and Organizations are recommended to include all of the basic features and to select from the additional features those that are best suited to their particular documents and issuing systems after conducting an assessment of the risks to which their documents are most susceptible.*
2. *The descriptions in the table above are necessarily abbreviated from the main text.*
3. *Certain of the features are repeated one or more times in the table. This indicates that the particular feature protects against more than one type of threat. It is only necessary to include these features once within any particular document.*

## INFORMATIVE APPENDIX 2 TO SECTION III

### MACHINE-ASSISTED DOCUMENT SECURITY VERIFICATION

*Note.— Doc 9303 does not specify a machine assisted verification method that is globally interoperable. The reliance on a single feature to verify authenticity carries a high risk that the method will be compromised. States should be aware of this risk should they choose to use a machine assisted feature for their own purposes in their MRtd.*

#### 1. Scope

1.1 This Appendix indicates machine verifiable security features that a State may optionally use for its own purposes as an aid to the authentication of a travel document, i.e. that help confirm its authenticity as a genuine document made from genuine materials. Features based on the detection of the presence of a substance or of a particular structure at a particular place in the MRtd are included, where the means of detection is processed by the reader or in conjunction with special software on the workstation. Features that involve the accessing of data stored on a contactless integrated circuit are excluded as they are considered in Doc 9303, Part 3, Volume 2.

#### 2. Types of machine assisted document verification features

2.1 Doc 9303 distinguishes three main categories of machine-verifiable security features. These are described below along with examples of security features that are capable of machine verification. This Appendix only describes features that can be verified by detection equipment associated with the MRtd reader or software during the normal reading process.

2.1.1 *Structure feature.* A structure feature is a security feature containing some form of verifiable information based on the physical construction of the feature. Examples include:

- the interference characteristic of a hologram or other optically variable device that can be uniquely identified by a suitable reader;
- retro-reflective images embedded within a security laminate;
- controlled transmission of light through selective areas of the substrate.

2.1.2 *Substance feature.* A substance feature involves the identification of a defined characteristic of a substance used in the construction of the feature. Examples include:

- the use of pigments, usually in inks, which respond in specific and unusual ways to specific wavelengths of light (which may include infrared or ultraviolet light) or have magnetic or electromagnetic properties.
- the incorporation into a component of the data page of materials, e.g. fibres or planchettes whose individual size or size distribution conform to a predetermined specification.

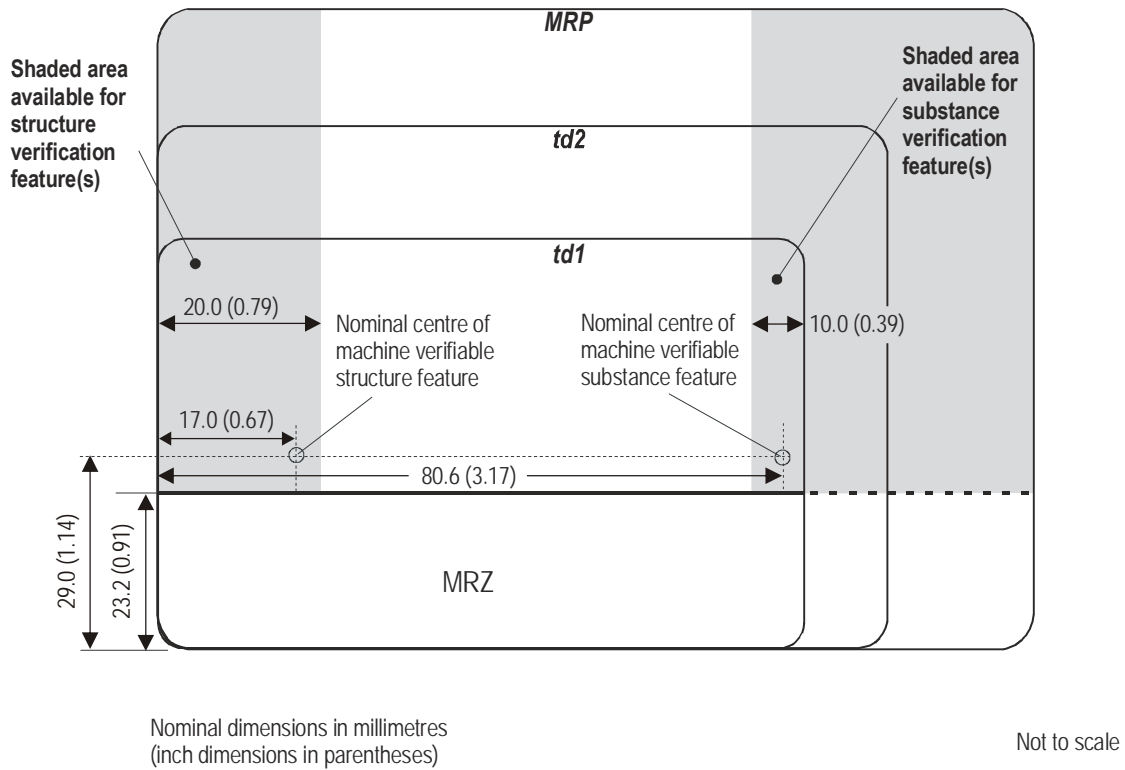
2.1.3 *Data feature.* The visible image of the MRtd may contain concealed information which may be detected by the reader or its associated software. The concealed information may be in the security printed image but it is more usually incorporated into the personalization data especially the portrait. Inserting the concealed information into the MRtd may involve the application of substance and/or structure features in a way which achieves several levels of security. The information may be decoded by the reader or its software set to look for the feature in a specific location. The information might, for example, be the document number. The reader could then be programmed to compare the document number detected from the feature with the document number appearing in the MRZ. Such a comparison involves no access to any data stored on the optional contactless integrated circuit described in Volume 2 of Doc 9303, Part 3. Examples of this type of feature are:

- encoded data stored on the document in magnetic media such as special security threads;
- designs incorporating the concealed data which only become detectable when viewed using a specific wavelength of light, optical filters, or a specific image processing software.

2.2 All three types of feature, structure, substance and data features may be incorporated in travel documents and verified with suitably designed readers or software. Readers are now becoming available that can detect such features and use the responses to assist in the examination of the document.

2.3 Machine assisted document security verification uses automated inspection technology to assist in verifying the authenticity of a travel document. It should not be used in isolation to determine proof of authenticity, but when used in combination with visible document security features, the technology provides the examiner with a powerful new tool to assist in verifying travel documents.

2.4 Machine assisted document security verification features are optional data elements that may be included on the MRtd at the discretion of the issuing authority. Figure III-1 provides guidance on the positions these features should occupy to facilitate interoperability. However, at present there are no specifications for the functionality or performance of any of these features and hence their use is currently restricted to national and bilateral use.



**Figure III-1**

This diagram shows the three sizes of MRTD with recommended positions for machine assisted document verification features. The shaded area on the left is recommended for the incorporation of a structure feature and that on the right for the incorporation of a substance feature.



## INFORMATIVE APPENDIX 3 TO SECTION III

### THE PREVENTION OF FRAUD ASSOCIATED WITH THE ISSUANCE PROCESS

*Note.— This Appendix is a summary of two papers prepared by a multinational group of experts. A detailed discussion of the recommendations enumerated below may be found in the full papers, published separately by ICAO.*

#### 1. Scope

1.1 This Appendix describes the fraud risks associated with the process of MRtd application and issuance. These risks are a consequence of the benefits that can accrue from the possession of an MRtd that can be used to confirm the identity and citizenship of the holder. The Appendix recommends precautions that an issuing State can take to prevent such fraud.

#### 2. Fraud and its prevention

2.1 Fraud perpetrated as part of the issuance process can be of several major types:

- theft of genuine blank MRtds and completion to make them look valid;
- applying for the MRtd under a false identity using genuine evidence of nationality and/or identity stolen from another individual, or otherwise obtained improperly;
- applying for the MRtd under a false identity using manufactured false evidence of nationality and/or identity;
- using falsely declared or undeclared lost and/or stolen MRtds that can be provided to people who might use them in look-alike fraud or with repetitive photo substitutions;
- reliance on MRtd employees to manipulate the MRtd system to issue an MRtd outside the rules.

2.2 There are two additional categories in which the applicant applies under his own identity but with the intention to be complicit in the later fraudulent use of the MRtd by:

- altering a genuinely issued document to make it fit a bearer who is not the person to whom the MRtd was issued;
- applying for an MRtd with the intention of giving or selling it to someone who resembles the true bearer.

### **3. Recommended measures against fraud**

3.1 To combat the above-mentioned threats, it is recommended that the MRtd-issuing authority of the State undertake the following measures, to the extent that adequate resources are available for their implementation.

3.2 A suitably qualified person should be appointed to be Head of Security directly responsible to the Chief Executive Officer of the issuing authority. The Head of Security should be responsible for ensuring that security procedures are laid down, observed and updated as necessary.

3.3 In each location where MRtds are issued there should be a designated Security Manager. The Security Manager should be responsible for the implementation and updating of the security procedures and report directly to the Head of Security.

3.4 Vetting procedures should be established to ensure that all staff are recruited only after searches have verified their identity, ensured that they have no criminal record, and verified that their financial position is sound. Regular follow-up checks should also be made to detect staff whose changed circumstances mean they may succumb to temptations to engage in fraudulent activity.

3.5 All staff within the MRtd-issuing authority should be encouraged to adopt a positive attitude toward security matters. There should be a system of rewards for any staff member who reports incidents or identifies measures that prevent fraud.

3.6 Controls should be established that account for key components such as blank books and security laminates. Such items should each bear a unique serial number and should be kept locked in suitable secure storage. Only the required number should be issued at the start of each working day or shift. The counting of the items should be done and the figures agreed by two members of staff who should also record the unique numbers of the items. The person to whom they are issued must account for all items at the end of the shift in the form of either personalized documents or defective product. All items should be returned to the secure store at the end of the working period, again having been counted by two people and the unique numbers logged. The records should be kept at least for the life of the issued MRtds.

3.7 Defective product or materials should be destroyed under controlled conditions and the unique numbers recorded.

3.8 The issuance process should be divided into discrete operations that are carried out in separate locations within the facility. The purpose is to ensure that no one person can carry out the whole issuance process without venturing into one or more areas that the person has no authorization to enter.

### **4. Procedures to combat fraudulent applications**

4.1 The following procedures are recommended to prevent the issue of a genuine MRtd as a result of receipt of a fraudulent application.

4.2 The MRtd-issuing office should appoint an appropriate number of anti-fraud specialists (AFS) who have received a high level of training in the detection of all types of fraud used in MRtd application. There should be at least one AFS present in each location in which MRtd applications and applicants are processed. An AFS should at all times be available to support those whose task it is to process applications (Authorizing Officers [AO]) and thus to provide assistance in dealing with any suspicious application. AFS personnel should regularly provide training to AOs to increase their awareness of potential fraud risks.

4.3 The MRtd-issuing authority should establish close liaisons with the issuers of “breeder documents” such as birth and marriage certificates and driving licences. Access to a database of death certificates assists in the prevention of fraud where an application for an MRtd is made in the name of a deceased person. The State should ensure that the departments holding records of births, marriages and deaths are reconciled and the data stored in a database, secure access to which should be available to the MRtd-issuing office. The aim is to facilitate rapid verification that submitted breeder documents are genuine and that an application is not being made, for example, in the name of a deceased person.

4.4 An applicant for an MRtd who has not held one previously should be required to present himself<sup>3</sup> at an MRtd-issuing office with supporting breeder documentation for an interview with an AO and, where necessary, an AFS.

4.5 The procedure specified in 4.4 may also be used to process applications for an MRtd to replace an expiring one. Alternatively, provided the MRtd-issuing office has an adequate database of personal information, including portraits, a replacement application may be processed by submission of the documentation, including a new portrait, by mail. In such cases it is desirable that the application and new portrait be endorsed by a responsible person. The return of the expiring MRtd with the new application should be required.

4.6 The MRtd-issuing office should initiate procedures that would prevent the fraudulent issue of more than one MRtd to an individual who may have attempted to assume more than one identity. Computer database checks of stored portraits using facial recognition and, where available, fingerprints can assist in this process.

4.7 Procedures in the MRtd-issuing office should prevent an applicant from selecting the AO who will serve him. Conversely the work flow should be such as to prevent any employee from selecting which applications he is to process.

4.8 The issuance of an MRtd to a young child should require the attendance at the issuing office of, preferably, both parents and of the child. This is to lower the risk of child smuggling or abduction of a child by one parent.

4.9 The replacement of an MRtd claimed to be lost or stolen should be made only after exhaustive checks including a personal interview with the applicant.

4.10 It is recommended that details, particularly document numbers, of lost or stolen MRtds be provided to the database operated by INTERPOL. This database is available to all participating countries and can be used in the development of watch lists.

## 5. Control of issuing facilities

5.1 A State should consider issuing all MRtds from one or, at most, two centres. This reduces the number of places where blank documents and other secure components are stored. The control of such a central facility can be much tighter than is possible at each of many issuing centres. If central issuance is adopted, the provision of centres where applicants can attend interviews is required. Furthermore, since standard MRtds cannot be issued instantly, a system should be established for the issue of emergency MRtds.

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3. Throughout this document, the use of the male gender should be understood to include male and female persons.

## IV. TECHNICAL SPECIFICATIONS COMMON TO BOTH SIZE 1 AND SIZE 2 MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS

### Scope

1. This section defines specifications that are common to both the size 1 and size 2 machine readable official travel documents (td1 and td2), including those necessary for global interoperability using visual inspection and optical character recognition reading with particular respect to the machine readable zone only. Further specifications applicable to the td1 only appear in Section V, and those applicable to the td2 only appear in Section VI. These specifications also apply to td1 and td2 documents that are electronically enabled; further specifications for electronically enabled MRtds are contained in Doc 9303, Part 3, Volume 2.

### Physical characteristics

2. Issuing States and organizations have the freedom to choose the materials to be used. Nevertheless, the MRtd shall, in normal use throughout its period of validity, meet the following requirements.

2.1 *Deformation.* The MRtd shall be of such nature that bends (not creases), i.e. deformation due to normal use, can be flattened by the reading device without impairing the use of the MRtd or the functioning of the reader.

2.2 *Toxicity.* The MRtd shall present no toxic hazards in the course of normal use (see also ISO/IEC 7810).

2.3 *Resistance to chemicals.* The MRtd shall be resistant to chemical effects arising from normal handling and use, except where chemical sensitivity is added for security reasons.

2.4 *Temperature stability.* The MRtd shall remain machine readable at operating temperatures ranging from  $-10^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  ( $14^{\circ}\text{F}$  to  $122^{\circ}\text{F}$ ). The MRtd should not lose its functionality after being exposed to temperatures ranging from  $-35^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$  ( $-31^{\circ}\text{F}$  to  $176^{\circ}\text{F}$ ).

2.5 *Humidity.* The MRtd shall be machine readable at a relative air humidity ranging from 5 per cent to 95 per cent, with a maximum wet bulb temperature of  $25^{\circ}\text{C}$  ( $77^{\circ}\text{F}$ ) (see also ISO/IEC 7810). The MRtd should not lose its reliability after being stored at, or exposed to, a relative air humidity ranging from 0 per cent to 100 per cent (non-condensing).

2.6 *Light.* The MRtd shall resist deterioration from exposure to light encountered during normal use (see also ISO/IEC 7810).

2.7 While material choices remain at the discretion of the individual issuing State or organization, no materials shall adversely affect any other component in the MRtd.

### General layout of the MRtd (td1 and td2)

3. The MRtd follows a standardized layout to facilitate reading of data globally by both visual and machine readable means (global interoperability).

4. To accommodate the various requirements of States' laws and practices and to achieve the maximum standardization within those divergent requirements, the MRtd is divided into seven zones as listed below. Zones I through VI constitute the visual inspection zone (VIZ). Zone VII is the machine readable zone (MRZ).

Zone I	Header (mandatory)
Zone II	Personal data elements (mandatory and optional)
Zone III	Document data elements (mandatory and optional)
Zone IV	Signature or usual mark (mandatory)
Zone V	Identification feature (mandatory)
Zone VI	Data elements (optional)
Zone VII	Machine readable zone (MRZ) (mandatory)

4.1 The location, contents and dimensional specifications of zones are set out in Section V, Appendix 4 for the td1 and Section VI, Appendix 4 for the td2.

### Content and use of zones

5. *Data elements.* The data elements to be included in the zones, the preparation of the zones and guidelines for the dimensional layout of zones shall be as described hereunder.

#### 5.1 *Mandatory zones*

5.1.1 Zone I on the front of the MRtd identifies the issuing State or organization and the document.

5.1.2 Data elements shall appear in a standard sequence in Zones II and III.

5.1.3 Zones II and III each contain a field in which optional data elements may be included. The optional field in Zone II shall be used for personal data elements and the optional field in Zone III for document-related details. Where an issuing State or organization does not use the optional fields in Zones II and III, there is no need to reserve the space for them on the MRtd.

5.1.4 Zone IV contains the holder's signature or usual mark. The issuing State shall decide the acceptability of a holder's usual mark.

5.1.5 Zone V shall contain the personal identification feature(s) which shall include a portrait solely of the holder. At the discretion of the issuing State or organization, the name fields in Zone II and the holder's signature or usual mark in Zone IV may overlay Zone V provided this does not hinder recognition of the data in any of the three zones.

5.1.6 Zone VII shall contain the machine readable data. Because of the smaller size of the td1, to accommodate the required data, three lines of machine readable data are included in the MRZ, while the larger size td2 has two lines of machine readable data. Detailed specifications for the MRZ of the td1 are given in Section V and for the td2 in Section VI. In both cases, Zone VII conforms in height to the MRZ defined for all MRTDs so that the machine readable data lines fall within the effective reading zone (ERZ) specified in Appendix 4 to this section.

5.1.7 All MRZ data elements shall be shown. For the td1 these are defined in Section V, paragraphs 6.5 through 6.7. For the td2 they are defined in Section VI, paragraphs 6.5 and 6.6.

5.2 *Optional data zone.* Zone VI, which appears on the back of the MRtd, is a zone for optional data for use at the discretion of the issuing State or organization. Zone VI will always appear irrespective of whether or not it is used.

### 5.3 *Dimensional flexibility of Zones I to V*

5.3.1 Zones I to V may be adjusted in size and shape within the overall dimensional specifications of the MRtd to accommodate the diverse requirements of issuing States and organizations. All zones, however, shall be bounded by straight lines, and all angles where straight lines join shall be right angles (i.e. 90 degrees). It is recommended that the zone boundaries not be printed on the MRtd. The location of the zones is shown in Appendix 1 to Section V to the td1 and to Section VI for the td2.

5.3.2 When an issuing State or organization chooses to produce an MRtd that contains a transparent or otherwise unprintable border around the card, this will result in a reduction of the available area within the zones. The full MRtd dimensions and zone boundaries shall be measured from the outside edge of this border, which is the external edge of the MRtd.

5.3.3 Zone I shall be located along the top edge of the MRtd and extend across the full width of the document. The issuing State or organization may vary the *vertical* dimension of Zone I, as required, but this dimension shall be sufficient to allow legible interpretation of the data elements in the zone and shall not be greater than 11.0 mm (0.43 in) for either side of the MRtd.

5.3.4 Zone V shall be located such that its left edge is coincident with the left edge of the MRtd. Zone V may vary in size but shall not exceed the maximum dimensional tolerance specified in Examples 1 and 2 of Appendix 4 to each section.

5.3.5 Zone V may move *vertically* along the left edge of the MRtd and overlay a portion of Zone I as long as individual details contained in either zone are not obscured. The precise scope for such movement is defined in Section V for the td1 and in Section VI for the td2.

5.3.6 The upper boundary of Zone II shall be coincident with the lower boundary of Zone I.

5.3.7 When there is a specific requirement for the name field to extend across the MRtd, Zone II may extend up to the full width of the MRtd as illustrated in Example 3 of Appendix 4 to Section V for the td1 and Section VI for the td2. In the event the full dimension is used, Zone II shall overlay a portion of Zone V, as illustrated in Example 2 of Appendix 5 to each section. In this case, issuing States and organizations shall ensure that data contained in either zone are not obscured. Example 1 of Appendix 5 to Section V for the td1 and in Section VI for the td2 illustrates a Zone II design less than the full dimensional width of the document.

5.3.8 The lower boundary of Zone II (see Appendix 4, Examples 3 through 5 in Section V for the td1 and in Section VI for the td2) may be positioned at the discretion of the issuing State or organization. Enough space must be left for Zones III and IV below the boundary. This boundary does not need to be straight across the longer dimension of the MRtd. Example 5 of Appendix 4 to Section V for the td1 and Example 4 of Appendix 4 to Section VI for the td2 illustrate a Zone II with the lower boundary on two levels. The flexible design for the Zone II illustrated conforms with the specifications defined in 5.3.1.

5.3.9 Zone III may start at the right vertical boundary of Zone V and may extend, at the discretion of the issuing State or organization, to the right edge of the MRtd. Examples 3 and 5 of Appendix 4 to Section V for the td1 and Section VI for the td2 illustrate a Zone III bounded by Zones V, II and IV.

5.3.10 The position of Zone IV is illustrated in all examples in Appendices 4 and 5 to Section V for the td1 and Section VI for the td2.

5.3.11 Zone IV may also overlay Zone V, though this practice is not recommended, as illustrated in Example 2 of Appendix 5 to Section V for the td1 and Examples 3 and 4 of Appendix 5 to Section VI for the td2. In this case, issuing States and organizations shall ensure that individual details contained in either zone are not obscured.

### Displayed identification feature(s) of the holder

6. *Displayed identification feature(s).* The MRtd shall incorporate on the front a mandatory displayed portrait of the holder. It may optionally display a fingerprint of the holder or reproduction thereof.

6.1 *Displayed portrait.* A displayed portrait of the rightful holder shall be a faithful reproduction of the image of the holder represented on/within (or a photograph securely affixed to) the substrate of the MRtd. The position and dimensions of the portrait on the MRtd are defined in Section V for the td1 and Section VI for the td2. Digital imaging is strongly recommended, as affixed photographs are prone to fraudulent photo substitution. Where digital imaging is used, the original portrait submitted for reproduction shall be the maximum permitted: 45.0 mm x 35.0 mm (1.77 in x 1.38 in); this will provide adequate resolution for scaling to required size for use on the MRtd while having adequate resolution for facial recognition purposes. See Appendix 5 to this section for examples of acceptable and unsatisfactory portraits. Necessary measures shall be taken by the issuing State or organization to ensure that the displayed portrait is resistant to forgery and substitution. The displayed portrait shall have been taken within the six months preceding the issue of the MRtd.

6.1.1 *Pose.* The displayed portrait shall depict the face of the rightful holder of the MRtd in a full-face frontal pose with both eyes visible, i.e. captured perpendicular to an imaginary plane formed parallel to the front surface of the face. The pose should be such that an imaginary horizontal line drawn between the centres of the eyes is parallel to the top and bottom edges of the rectangular image and, when incorporated into the MRtd, to the longer edge of the document. (See Appendix 5 to this section.)

6.1.2 *Depth of field.* The full-face frontal pose shall be in focus from the crown (top of the head ignoring any hair) to the chin and from the nose to the ears.

6.1.3 *Orientation.* The crown (top of the head ignoring any hair) shall be nearest the top edge of the MRtd, i.e. the crown-to-chin orientation covering the longer dimension defined for Zone V.

6.1.4 *Face size.* The crown-to-chin portion of the full-face frontal pose shall be 70 to 80 per cent of the longest dimension defined for Zone V, maintaining the aspect ratio between the crown-to-chin and ear-to-ear details of the face of the holder. The 70 to 80 per cent requirement may mean cropping the picture so that not all the hair is visible.

6.1.5 *Centring.* The full-face frontal pose shall be centred within Zone V.

6.1.6 *Capturing the full-face frontal pose of the holder*

6.1.6.1 *Lighting.* Adequate and uniform illumination shall be used to capture the full-face frontal pose, i.e. appropriate illumination techniques shall be employed and illumination used to achieve natural skin tones (and avoid any colour cast) and a high level of detail, and minimize shadows, hot spots, red eye and reflections (such as sometimes caused by spectacles).

6.1.6.2 *Background.* A uniform light-coloured background shall be used to provide a contrast to the face and hair. For colour portraits, light blue, beige, light brown, pale grey or white are recommended for the background.

6.1.6.3 *Quality of captured portrait.* The quality of the original captured portrait should at least be comparable to the minimum quality acceptable for photographs (resolution comparable to 6–8 line pairs per millimetre). To achieve this comparable image quality in a digital reproduction, careful attention must be given to the image capture, processing, digitization, compression and printing technology and the process used to produce the portrait, including the final preparation of the MRtd.

6.1.7 *Colour.* The displayed portrait shall be monochrome greyscale or a true-colour representation of the holder.

6.1.8 *Glasses.* The portrait shall show the eyes clearly with no light reflection off the glasses and no tinted lenses. If possible, avoid heavy frames. The frames must not cover any part of the eyes. Glasses should appear only if permanently worn.

6.1.9 *Head coverings.* Head coverings shall not be accepted except in circumstances that the competent State authority specifically approves. Such circumstances may be religious, medical or cultural. The face must be visible from the hairline to the chin and forward of the ears.

6.1.10 *Facial ornaments.* The issuing State shall use its discretion as to the extent to which facial ornaments (e.g. nose rings, studs) may appear in the portrait. A facial ornament should appear only if it is permanently worn.

6.1.11 *Digitally printed reproduction*

6.1.11.1 *Digital reproduction quality.* The digital reproduction shall yield an accurate recognizable representation of the rightful document holder. The quality of a digitally reproduced portrait should be visually comparable to a minimally acceptable photograph. To achieve this comparable image quality in a digital reproduction, careful attention must be given to the image capture, processing, digitization, compression and printing technology and the process used to reproduce the portrait in the final document, including the final preparation of the MRtd.

6.1.11.2 *Border.* A border or frame shall not be used to outline a digitally printed reproduction.

6.1.11.3 *Coexistence with background security treatment(s).* A digitally printed reproduction shall coexist with background security treatment(s) located within Zone V, i.e. background security printing shall not interfere with proper viewing of the displayed portrait, and vice versa.

6.1.12 *Coexistence with final preparation treatment(s) of the MRtd.* A displayed portrait shall coexist with final preparation treatment(s), i.e. final preparation treatment(s) shall not interfere with proper viewing of the displayed portrait, and vice versa.

6.1.13 *Portraits of babies.* A portrait of a baby should be produced if possible conforming to the above specifications. Ideally, the baby should be photographed in an upright position but it is acceptable to capture the portrait with the baby lying on a white or plain light-coloured blanket. Alternatively the baby may be placed in a baby seat but there shall be white or plain light-coloured background behind the head. The baby's eyes shall be open and no supporting hands visible.

6.2 *Displayed signature or usual mark.* A displayed signature or usual mark, the acceptability of which is at the issuing State's discretion, appears in Zone IV. The signature shall be an original created on the MRtd



or, more probably, a digitally printed reproduction of an original. Necessary measures shall be taken by the issuing State or organization to ensure that the displayed signature or usual mark is resistant to forgery and substitution. The displayed signature or usual mark shall meet the following requirements.

6.2.1 *Orientation.* The displayed signature or usual mark shall be displayed with its A-dimension parallel to the reference (longer) edge of the MRtd as defined in Figure IV-1.

6.2.2 *Size.* The displayed signature or usual mark shall be of such dimensions that it is discernible by the human eye (i.e. reduced in size by no more than 50 per cent), and the aspect ratio (A-dimension to B-dimension) of the original signature or usual mark is maintained.

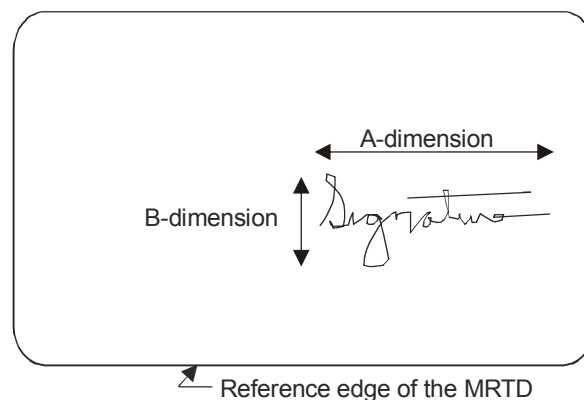
6.2.3 *Scaling for reproduction using digital printing.* In the event the displayed signature or usual mark is scaled up or scaled down, the aspect ratio (A-dimension to B-dimension) of the original signature or usual mark shall be maintained.

6.2.4 *Cropping for reproduction using digital printing.* The issuing State or organization should take steps to eliminate or minimize cropping.

6.2.5 *Colour.* The displayed signature or usual mark shall be displayed in a colour that affords a definite contrast to the background.

6.2.6 *Borders.* Borders or frames shall not be permitted or used to outline the displayed signature or usual mark.

6.3 *Displayed single-digit fingerprint.* A displayed single-digit fingerprint, if required by the issuing State, shall be either an original created on the MRtd substrate by the holder or, more probably, a digitally printed reproduction of an original. Necessary measures shall be taken by the issuing State or organization to ensure that the single-digit fingerprint is resistant to forgery and substitution. The single-digit fingerprint shall meet the following requirements.



**Figure IV-1. Orientation of the displayed signature or usual mark**

6.3.1 **Orientation.** The A-dimension (width) of the displayed single-digit fingerprint shall be parallel to the reference edge of the MRtd as defined in Figure IV-2. The top of the finger shall be that portion of the single-digit fingerprint furthest away from the reference edge of the MRtd. See Examples 2 and 4 in Appendix 5 to Section VI for the td2.

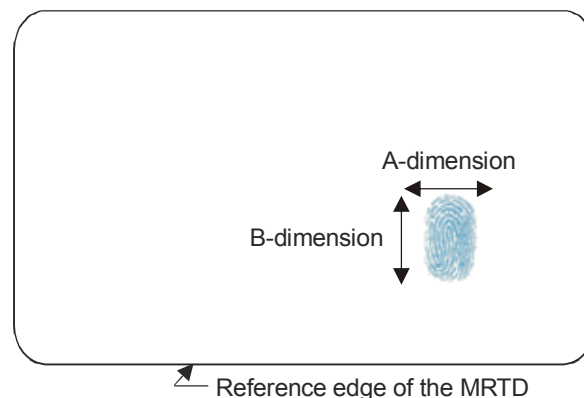
6.3.2 **Size.** The displayed single-digit fingerprint shall be a one-to-one replication (A-dimension versus B-dimension) of the original print.

6.3.3 **Scaling for reproduction using digital printing.** Scaling of a single-digit fingerprint shall not be permitted.

6.3.4 **Cropping for reproduction using digital printing.** The issuing State or organization should take steps to eliminate or minimize cropping.

6.3.5 **Colour.** The displayed single-digit fingerprint shall be displayed in a colour that affords a definite contrast to the background.

6.3.6 **Borders.** Borders or frames shall not be permitted or used to outline the displayed single-digit fingerprint.



**Figure IV-2. Orientation of the displayed single-digit fingerprint**

#### **Layout of the MRtd applicable to both td1 and td2**

7. Paragraphs 8 and 9 describe matters relating to the layout of the MRtd that are common to both the td1 and the td2. Detailed matters of layout specific to each type of MRtd are defined in Section V for the td1 and in Section VI for the td2.

8. **Visual Inspection Zone (VIZ) (Zones I through VI)**

8.1 The VIZ consists of zones containing mandatory and optional data fields to accommodate the diverse requirements of issuing States and organizations while maintaining sufficient uniformity to ensure global interoperability for all MRtds.

## 8.2 *Entered data in the VIZ*

8.2.1 *Typeface and type size.* The selection of typeface and type size used within the VIZ is at the discretion of the issuing State or organization. For good legibility a type size with 10 characters per 25.4 mm (1.0 in) is recommended. A maximum horizontal printing density of 15 characters per 25.4 mm (1.0 in) should not be exceeded. This printing density has been chosen as the smallest in which information is clear and legible by a person with normal eyesight.

8.2.2 Use of upper-case characters is recommended. However, where a name includes a prefix, an appropriate mixture of upper and lower case characters may be used in the prefix.

8.2.3 Diacritical marks (accents) may be used with either lower- or upper-case characters, at the option of the issuing State or organization.

8.3 *Languages and characters.* These specifications provide for entered data in the VIZ to appear in Latin-alphabet characters, i.e. A to Z, and Arabic numerals, i.e. 1234567890. When the mandatory elements of Zones I, II and III are in a national language that does not use the Latin alphabet, a transliteration shall also be provided. States that use other than Arabic numerals to represent numerical data in the VIZ shall provide a translation into Arabic numerals. It is strongly recommended that issuing States using non-Latin alphabet characters in the optional fields of the VIZ translate the entered data into English, French or Spanish in these fields as well, in the interests of facilitation. In the case of the name of the issuing State, or place of issue or place of birth, the representation in the original language shall be accompanied by a translation of the name into English, French or Spanish, when the translated name is more familiar to the international community. Optional data elements should be entered in both the national language and one of the English, French or Spanish languages. Optional data in Zone VI may be entered entirely in the national script and/or language.

8.4 *Fields.* Captions shall be used to identify all fields for mandatory data elements in the VIZ except as specified in the data element directory for the VIZ in Section V for the td1 and Section VI for the td2, and may be in the official language of the issuing State or working language of the issuing organization. If the official language of the issuing State or working language of the issuing organization used for captions is other than English, French or Spanish, one of these languages shall also be used, and the translation of the caption should be presented in italics.

8.4.1 *Unused fields.* When a field is not used, the caption shall not appear on the VIZ of the MRtd.

8.4.2 If any optional field or data element is not used, the data may be spread more evenly in the visual zone of the MRtd consistent with the requirement for sequencing zones and data elements.

## **Mandatory machine readable zone (MRZ) (Zone VII)**

### 9. *Purpose of the MRZ*

9.1 MRtds produced in accordance with Doc 9303 incorporate an MRZ to facilitate inspection of travel documents and reduce the time taken up in the travel process by administrative procedures. In addition, the MRZ provides verification of the information in the VIZ and may be used to provide search characters for a database inquiry. As well, it may be used to capture data for registration of arrival and departure or simply to point to an existing record in a database.

9.1.1 The MRZ provides a set of essential data elements in a format, standardized for each type of MRTD, that can be used by all receiving States regardless of their national script or customs.

9.1.2 The data in the MRZ are formatted in such a way as to be readable by machines with standard capability worldwide. It must be stressed that the MRZ is reserved for data intended for international use in conformance with international Standards for MRTDs. The MRZ is a different representation of the data than is found in the VIZ. The VIZ contains data not specifically intended to be read by machine, and herein data can be included in the national script of the issuing State provided that it is also transliterated into Latin-alphabet characters in conformance with 8.3. On the other hand, the constraints posed by machine reading in the MRZ do not permit such flexibility.

## 9.2 *Properties of the MRZ*

9.2.1 In consideration of national privacy laws, the data in the MRZ must be visually readable as well as machine readable. Data presentation must conform to a common standard such that all machine readers configured in conformance with Doc 9303 can recognize each character and communicate in a standard protocol (e.g. ASCII) that is compatible with the technology infrastructure and the processing requirements defined by the receiving State.

9.2.2 To meet these requirements, OCR-B typeface is specified in Doc 9303 as the medium for storage of data in the MRZ. The MRZ as defined herein is recognized as the machine reading technology essential for global interchange and is therefore mandatory in all types of MRTDs.

## 9.3 *Constraints of the MRZ*

9.3.1 The characters allowed in the MRZ are a common set (as defined in Appendix 3 to this section) which can be used by all States. National characters generally appear only in the computer-processing systems of the States in which they apply and are not available globally. They shall not, therefore, appear in the MRZ.

9.3.2 Diacritical marks are not permitted in the MRZ. Even though they may be useful to distinguish names, the use of diacritical marks in the MRZ would confuse machine-reading equipment, resulting in less accurate database searches.

9.3.3 The number of character positions available for data in the MRZ is limited and varies according to the type of MRTD. The length of the data elements inserted in the MRZ must conform to the size of the respective fields as specified in the MRZ data element directory in Section V for the td1 and in Section VI for the td2.

9.3.4 In some instances, names in the MRZ may not appear in the same form as in the VIZ. In the VIZ, non-Latin and national characters may be used to represent more accurately the data in the script of the issuing State or organization.

## 9.4 *Data position/data elements/check digits/print specifications/print position in the MRZ*

9.4.1 *Data position.* Appendix 3 to Section V for the td1 and to Section VI for the td2 defines the location of the MRZ and the nominal position of the data therein.

9.4.2 *Data elements.* The data elements corresponding to specified fields of the VIZ shall be printed, in machine readable form, in the MRZ, beginning with the left most character position in each field in the sequence indicated in the data structure specifications for each document type. Details on the data elements to be included in the MRZ are set out in Section V for the td1 and in Section VI for the td2.

9.4.3 *Check digits.* The data structure of the machine readable lines provides for the inclusion of check digits. The basic method of calculating check digits is given in paragraph 15 of this section. The position of check digits and the data used in their calculation differ between MRTDs, and a table defining this information is set out in paragraph 8 of Section V for the td1 and of Section VI for the td2.

9.4.4 *Print specifications.* Machine readable data shall be printed in OCR-B type font, size 1, constant stroke width characters, at a fixed width spacing of 2.54 mm (0.1 in), i.e. horizontal printing density of 10 characters per 25.4 mm (1.0 in) as specified in ISO 1073-2. Printed characters are restricted to those defined in Appendix 2 to this section.

9.4.5 *Print position.* Reference centre lines for the OCR lines within the MRZ and a nominal starting position for the first character of each line are set out in appendices to Section V for the td1 and to Section VI for the td2.

9.5 *Machine readable zone (MRZ).* The dimensions of the MRZ (Zone VII) are fixed for each type of MRTD. Details are set out in Section V for the td1 and in Section VI for the td2.

### **Convention for writing the name of the holder**

#### 10. *Visual inspection zone (VIZ)*

10.1 The issuing State or organization shall establish which part of the name is the primary identifier — this may be the family name, the main name, the surname, and in some cases, the entire name. This shall be entered in the field for the primary identifier in the VIZ. It is recommended that upper-case characters be used, except in the case of a prefix, e.g. “von,” “Mc” or “de la,” in which a mixture of upper and lower case is appropriate.

10.2 The remaining parts of the name are the secondary identifier. These may be the forenames, familiar names, given names, or any other secondary names. These names shall be written in the field for the secondary identifier in the VIZ. It is recommended that upper-case characters be used throughout. If a single field is used for the name, then the secondary identifier should be separated from the primary identifier by a single comma (,). A comma is not needed if multiple fields are used.

10.3 It is recommended that prefixes and suffixes including titles, professional and academic qualifications, honours, awards, and hereditary status, not be included in the VIZ. However, if an issuing State or organization considers a prefix or suffix to be legally part of the name, the prefix or suffix can appear in the VIZ. Numeric characters should not be written in the name fields of the VIZ. Where the use of numeric characters is a legal naming convention in the issuing States, these should be represented in Roman numerals. Any prefixes, suffixes or Roman numerals shall be entered in the secondary identifier field.

10.4 National characters may be used in the VIZ. If the national characters are not Latin-based, then a transliteration into Latin characters shall be provided.

#### 11. *Machine readable zone (MRZ)*

11.1 To achieve global interoperability, the primary and/or secondary identifiers shall conform to requirements of the limited OCR-B character set permitted in the MRZ and to the number of character positions available. The issuing State or organization shall be responsible for any transliteration or truncation, specifications for which are provided in 11.6.

11.2 In the MRZ, the name of the holder shall be printed using upper-case OCR-B characters, specified in Appendix 3, without diacritical marks.

11.3 The primary identifier, using the Latin character transliteration (if applicable), shall be written in the upper machine readable line, with the starting character position as set out in the section(s) specific to the preparation of the different types of MRTDs contained in the applicable part of Doc 9303. It shall be followed by two filler characters (<<). The secondary identifier, using the Latin character transliteration (if applicable), shall be written starting in the character position immediately following the two filler characters.

11.4 If the primary or secondary identifiers have more than one name component, each component shall be separated by a single filler character (<).

11.5 Filler characters (<) should be inserted immediately following the final secondary identifier (or following the primary identifier in the case of a name having only a primary identifier) through to the last character position in the machine readable line.

11.6 The number of character positions in the name field is limited and differs for the different types of MRTDs. If the primary and secondary identifiers, written in the relevant machine readable line using the above procedure, exceed the available character positions, then truncation shall be carried out using the procedure set out in the section(s) specific to the preparation of the different types of MRTDs contained in the applicable part of Doc 9303. In all other cases, the name shall not be truncated.

11.6.1 In truncating the name components, the last character of the name field shall be an alpha character (A to Z inclusive) as an indication that truncation has occurred (see the data element directory of the MRZ in the section(s) specific to the preparation of the different types of MRTDs contained in the applicable part of Doc 9303).

*Note.— Where long names extend to the last character position in the name field, the presence of an alpha character means that the name must be treated as though truncation had occurred.*

11.6.2 Examples of truncation of names are contained in Section V for the td1 and in Section VI for the td2.

11.7 Prefixes and suffixes, including titles, professional and academic qualifications, honours, awards, and hereditary status, shall not be included in the MRZ except where the issuing State considers these to be legally part of the name. In such cases, prefixes or suffixes shall be represented as components of the secondary identifier(s).

11.8 Numeric characters shall not be used in the name fields of the MRZ.

11.9 Punctuation characters are not allowed in the MRZ. Where these appear as part of a name, they should be treated as follows:

*Apostrophe:*

This shall be omitted; name components separated by the apostrophe shall be combined, and no filler character shall be inserted in its place in the MRZ.

*Example*     VIZ:   D'ARTAGNAN  
              MRZ:   DARTAGNAN

*Hyphen:*

Where a hyphen appears between two name components, it shall be represented in the MRZ by a single filler character (<).

*Example* VIZ: MARIE-ELISE  
MRZ: MARIE<ELISE

*Comma:*

Where a comma is used in the VIZ to separate the primary and secondary identifiers, the comma shall be omitted in the MRZ, and the primary and secondary identifiers shall be separated in the MRZ by two filler characters (<<).

*Example* VIZ: ERIKSSON, ANNA MARIA  
MRZ: ERIKSSON<<ANNA<MARIA

Otherwise, where a comma is used in the VIZ to separate two name components, it shall be represented in the MRZ as a single filler character (<).

*Example* VIZ: ANNA, MARIA  
MRZ: ANNA<MARIA

*Other punctuation characters:*

All other punctuation characters shall be omitted from the MRZ (i.e. no filler character shall be inserted in their place in the MRZ).

#### 11.10 *Transliteration of national characters in names in the MRZ*

11.10.1 Names in the MRZ are represented differently from those in the VIZ. National characters must be transliterated using only the allowed OCR character set defined in Appendix 3 to this section. Issuing States or organizations should adopt the recommended transliterations specified in Appendix 2 to this section, if applicable. Appendix 2 represents the most commonly used national characters of the Latin and Cyrillic families of languages.

### **Representation of issuing State or organization and nationality of holder**

#### 12. *Visual inspection zone (VIZ)*

12.1 Where the issuing State and/or the place of issue or place of birth are in a national language that does not use Latin characters, the name of the State or other location shall appear in the national language and also shall be either transliterated into Latin characters or translated into one or more languages (at least one of which must be English, French or Spanish) by which the name may be more commonly known to the international community. The name in the different languages shall be separated by an oblique character (/) followed by at least one blank space.

12.2 Where the name of the issuing State or place of issue or place of birth is in a language that uses the Latin alphabet, but the name is more familiar to the international community in its translation into another language or languages (particularly English, French or Spanish), the name in the national language should be accompanied by one or more translations of the name. The name in the different languages shall be separated by an oblique character (/) followed by at least one blank space.

12.3 The three-letter codes listed in Appendix 1 to this section may also be used, at the discretion of the issuing State or organization, to complete the field for the place of birth in the VIZ.

13. *Machine readable zone (MRZ)*

13.1 The three-letter codes listed in Appendix 1 to this section shall be used to complete the field for the issuing State or organization and the nationality in the MRZ.

**Representation of dates**

14. Dates shall be presented as set forth hereunder.

14.1 *Dates in the VIZ.* Dates in the VIZ of the MRtd shall be entered in accordance with the Gregorian calendar as follows.

14.1.1 Days shall be shown by a two-digit number, i.e. the dates from one to nine shall be preceded by a zero. This number shall be followed by a blank space.

14.1.2 The month may be printed in the language of the issuing State or organization or abbreviated, using up to four character positions.

14.1.3 Where the language of the issuing State or organization is not English, French or Spanish, the month as defined in 14.1.2 shall be followed by an oblique character (/) and the month or the abbreviation of the month up to four character positions, in one of the three languages, as shown in the table below.

**Abbreviations of months in English, French and Spanish**

<i>Month</i>	<i>English</i>	<i>French</i>	<i>Spanish</i>
January	Jan	Jan	Ene
February	Feb	Fév	Feb
March	Mar	Mars	Mar
April	Apr	Avr	Abr
May	May	Mai	Mayo
June	Jun	Juin	Jun
July	Jul	Juil	Jul
August	Aug	Août	Ago
September	Sep	Sept	Sept
October	Oct	Oct	Oct
November	Nov	Nov	Nov
December	Dec	Déc	Dic

*Note.— Where the language of the issuing State or organization is English, French or Spanish, the issuing State or organization should use one of the other two languages (shown in the table above) following the oblique character (/).*

14.1.4 The year will normally be shown by the last two digits and be preceded by a blank space.

14.1.5 As an example, a date of 12 July 1942 on an MRtd data page issued in Italian with French translation of the month would normally appear as follows:

12bLUGb/JUILb42



where b = a single blank space, i.e. 12 LUG /JUIL 42

14.1.6 The month may, however, be printed in numerical form in the VIZ, at the discretion of the issuing State or organization, particularly where this might facilitate the use of the MRtd by countries using other than the Gregorian calendar. Following a practice established to facilitate the visual inspection of travel documents, a date would be written DDbMMbYY, where b = a single blank space. For example, a date of 12 July 1942 would appear in the visual zone of the MRtd as follows: 12 07 42. However, when the month is represented numerically, the issuing State or organization may use the four-digit representation of the year in the VIZ, e.g. 12 07 1942.

14.1.7 *Unknown date of birth.* Where a date of birth is completely unknown, that data element shall appear as XXbXXXbXX where b = a single blank space. If only part of the date of birth is unknown, that part shall be represented by XX if it is the day or year, or by XXX if it is the month.

14.2 *Dates in the MRZ.* Dates in the MRZ of the MRtd shall, in accordance with the principle set forth in ISO 8601, be shown as a six-digit number consisting of the last two digits for the year (YY) immediately followed by two digits for the number of the month (MM) and by two digits for the day (DD). The structure is as follows: YYMMDD.

14.2.1 Following this format, the example given in 14.1.6 will be shown as: 420712.

14.2.2 If all or part of the date of birth is unknown, the relevant character positions shall be completed with filler characters (<).

### Check digits in the machine readable zone

15. Check digits are used within the machine readable zone to provide verification that the entered data are correctly interpreted. Details on the calculation of check digits in the MRZ are set out below.

15.1 *Calculation of check digits in the MRZ.* A special check digit calculation has been adopted for use in MRTDs. The check digits shall be calculated on modulus 10 with a continuously repetitive weighting of 731 731 ..., as follows.

15.1.1 *Step 1.* Going from left to right, multiply each digit of the pertinent numerical data element by the weighting figure appearing in the corresponding sequential position.

15.1.2 *Step 2.* Add the products of each multiplication.

15.1.3 *Step 3.* Divide the sum by 10 (the modulus).

15.1.4 *Step 4.* The remainder shall be the check digit.

15.1.5 For data elements in which the number does not occupy all available character positions, the symbol < shall be used to complete vacant positions and shall be given the value of zero for the purpose of calculating the check digit.

15.1.6 When the check digit calculation is applied to data elements containing alphabetic characters, the characters A to Z shall have the values 10 to 35 consecutively, as follows:



Sample data element:	D	2	3	1	4	5	8	9	0	7
Assigned numeric values:	13	2	3	1	4	5	8	9	0	7
Weighting:	7	3	1	7	3	1	7	3	1	7
Step 1 (multiplication) Products:	91	6	3	7	12	5	56	27	0	49

Sample data element:	<	<	<	<	<	<	<	<	<	<
Assigned numeric values:	0	0	0	0	0	0	0	0	0	0
Weighting:	3	1	7	3	1	7	3	1	7	3
Step 1 (multiplication) Products:	0	0	0	0	0	0	0	0	0	0

Sample data element:	<	<	<	<	<
Assigned numeric values:	0	0	0	0	0
Weighting:	1	7	3	1	7
Step 1 (multiplication) Products:	0	0	0	0	0

Sample data element:	3	4	0	7	1	2	7	9	5	0
Assigned numeric values:	3	4	0	7	1	2	7	9	5	0
Weighting:	3	1	7	3	1	7	3	1	7	3
Step 1 (multiplication) Products:	9	4	0	21	1	14	21	9	35	0

Sample data element:	7	1	2	2	<	<	<	<	<	<
Assigned numeric values:	7	1	2	2	0	0	0	0	0	0
Weighting:	1	7	3	1	7	3	1	7	3	1
Step 1 (multiplication) Products:	7	7	6	2	0	0	0	0	0	0

Sample data element:	<	<	<	<	<
Assigned numeric values:	0	0	0	0	0
Weighting:	7	3	1	7	3
Step 1 (multiplication) Products:	0	0	0	0	0

Step 2 (sum of products)	91	+	6	+	3	+	7	+	12	+	5	+	56	+	27	+	0	+	49	+
Step 2 (sum of products)	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+
Step 2 (sum of products)	0	+	0	+	0	+	0	+	9	+	4	+	0	+	21	+	1	+		+
Step 2 (sum of products)	14	+	21	+	9	+	35	+	0	+	7	+	7	+	6	+	2	+	0	+
Step 2 (sum of products)	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+	0	+
=Step 2 (sum of products)	392																			
Step 3 (division by modulus)	<u>392</u>	=	39	,	remainder	2														
	10																			

Step 4. Check digit is the remainder, 2. The middle line of MRZ data together with its composite check digit may consequently be written as follows: 3407127M9507122UT0<<<<<<<<<<<<<2.

15.2.2 Example 4 — Application of composite check digit on a **td2**. Using the lower line of MRZ data that follows as an example for coding the composite check digit, the calculation will be:  
Lower machine readable line (character positions 1–35):

HA672242<6UT05802254M9601086<<<<<<<<

Sample data element:	H	A	6	7	2	2	4	2	<	6
Assigned numeric values:	17	10	6	7	2	2	4	2	0	6
Weighting:	7	3	1	7	3	1	7	3	1	7
Step 1 (multiplication) Products:	119	30	6	49	6	2	28	6	0	42

Sample data element:	5	8	0	2	2	5	4	9	6	0
Assigned numeric values:	5	8	0	2	2	5	4	9	6	0
Weighting:	3	1	7	3	1	7	3	1	7	3
Step 1 (multiplication) Products:	15	8	0	6	2	35	12	9	42	0

Sample data element:	1	0	8	6	<	<	<	<	<	<
Assigned numeric values:	1	0	8	6	0	0	0	0	0	0
Weighting:	1	7	3	1	7	3	1	7	3	1
Step 1 (multiplication) Products:	1	0	24	6	0	0	0	0	0	0

Sample data element:	<
Assigned numeric values:	0
Weighting:	7
Step 1 (multiplication) Products:	—

Step 2 (sum of products)	119+	30 +	6 +	49 +	6 +	2 +	28 +	6 +	0 +	42 +
Step 2 (sum of products)	15 +	8 +	0 +	6 +	2 +	35 +	12 +	9 +	42 +	0 +
Step 2 (sum of products)	1 +	0 +	24 +	6 +	0 +	0 +	0 +	0 +	0 +	0 +
Step 2 (sum of products)	0									
Step 2 (sum of products)	= 448									
	<u>448</u> = 44, remainder 8									
	10									

Step 4. Check digit is the remainder, 8. The lower line of MRZ data together with its composite check digit may consequently be written as follows:

HA672242<6UT05802254M9601086<<<<<<<8.

15.3 Check digit numbers, positions and character positions used in the calculation for each size of MRtd are given in Paragraph 8 of Section V for the td1 and of Section VI for the td2. For convenience they are repeated below:

15.3.1 *Check digits in the MRZ of a td1:* Four check digits appear in the MRZ of a td1. In the upper line a check digit in position 15 is calculated from the characters of the document number in positions 6 to 14. In the middle line a check digit in position 7 is calculated from the date of birth in positions 1 – 6; a second check digit in position 15 of the middle line is calculated from the date of expiry in positions 9 – 14; a third check digit in position 30 of the middle line is a composite check digit being calculated from positions 6 – 30 in the upper line and positions 1 – 7, 9 – 15 and 19 – 29 of the middle line. If the document number has more than 9 characters, the 9 principal characters shall be shown in the MRZ in character positions 6 to 14. They shall be followed by a filler character instead of a check digit to indicate a truncated number. The remaining characters of the document number shall be shown at the beginning of the field reserved for optional data elements (character positions 16 to 30 of the upper machine readable line) followed by a check digit and a filler character.

15.3.2 *Check digits in the MRZ of a td2:* Four check digits appear in the MRZ of a td2, all in the lower line. A check digit in position 10 is calculated from the document number character positions 1 – 9; a second check digit in position 20 is calculated from the date of birth in positions 14 – 19; the third check digit appears in

position 28 and is calculated from the date of expiry in positions 22 – 27; and the composite check digit in position 36 is calculated from the characters in positions 1 – 10, 14 – 20 and 22 – 35. If the document number has more than 9 characters, the 9 principal characters shall be shown in the MRZ in character positions 1 to 9. They shall be followed by a filler character instead of a check digit to indicate a truncated number. The remaining characters of the document number shall be shown at the beginning of the field reserved for optional data elements (character positions 25 to 35 of the lower machine readable line) followed by a check digit and a filler character.

### **Machine reading requirements and the effective reading zone**

16. *Effective reading zone.* A fixed-dimensional reading area (effective reading zone or ERZ of 17.0 mm × 118.0 mm (0.67 in × 4.65 in)), sized to accommodate the largest MRTD, is defined to allow use of a single machine reader for all sizes of MRTDs. The location of the ERZ is as defined in Appendix 4 to this section. The provision of the ERZ is not intended to allow additional tolerance for the printing positions defined in the appendices to the section(s) specific to the preparation of the different types of MRTDs. The ERZ is intended to allow for variances due to the manual placement of machine readable visas (MRVs) and the fanning effect of the pages that takes place when reading an interior page of an MRP. It also allows for the reading of MRtds with either two or three lines of machine readable data.

16.1 To combat the threat to travel document security posed by, for example, photocopiers, security features are permitted in the MRZ, and any such security feature shall not interfere with accurate reading of the OCR characters at the B900 range, as defined in ISO 1831. While OCR characters must be visible, as specified in 9.2.1, to ensure that all MRTDs, including those with security features in the MRZ, can be successfully read, the OCR characters in the MRZ shall be machine readable only in the near infrared portion of the spectrum (i.e. the B900 band defined in ISO 1831).

### **Characteristics of the machine readable zone**

17. Except as otherwise specified herein, the MRtd shall conform with ISO 1831 concerning the following matters:

- Optical properties of the substrate to be used;
- Optical and dimensional properties of the image patterns forming OCR characters;
- Basic requirements related to the position of OCR characters on the substrate.

17.1 Machine readable data shall be arranged from left to right in fixed-length fields in three lines (upper, middle and lower) for the td1 or two lines (upper and lower) for the td2. The data is presented in the order specified in the data structure tables and located on the document as shown in Section V for the td1 and Section VI for the td2. Data shall be entered in each field, beginning with the left-hand character position.

17.2 Where the entered data do not occupy all the character positions specified for the relevant field, the symbol < shall be used to fill the unoccupied positions.

### **Quality specifications of the machine readable zone**

18. In general, the print quality shall conform to ISO 1831 Range X, except as otherwise provided herein. All quality specifications set forth hereunder shall apply to the MRtd after final preparation, except where otherwise noted, and conform to the requirements of Section IV.

- 18.1 *Substrate quality.* ISO 1831, 4.3 through 4.3.2, shall be used for reference only.
- 18.2 *Substrate opacity.* The substrate used, measured before and after final preparation, shall be within the definition of at least medium opacity (ISO 1831, 4.4.1 and 4.4.3).
- 18.3 *Substrate gloss.* The level of gloss is not specified.
- 18.4 *Fluorescence.* The reflectance of the substrate in the visible spectrum shall exhibit no visibly detectable fluorescence when irradiated by ultraviolet light, except where this is a predictable fluorescence for security reasons.
- 18.5 *Alternative substrates.* The guidelines in 18.1 to 18.4 should be followed irrespective of the substrate material.
- 18.6 *Spectral band.* The OCR print shall be legible visually and shall be black (B425 through B680 as defined in ISO 1831). The OCR print shall also absorb in the B900 band as defined in ISO 1831 (i.e. near infrared).
- 18.7 *Print contrast signal (PCS).* After final preparation, the minimum print contrast signal (PCS/min), when measured as specified in ISO 1831, shall be as follows: PCS/ min  $\geq 0.6$  at the B900 spectral band.
- 18.8 *Character stroke width.* The stroke width after final preparation shall be as specified for Range X in ISO 1831 (5.3.1).
- 18.9 *Contrast variation ratio (CVR).* After final preparation, the CVR should be as is shown for Range X in ISO 1831, i.e. CVR < 1.50.
- 18.10 *Spots and extraneous marks.* ISO Standard 1831 (5.4.4.6 and 5.4.5.12) shall apply at the reading surface (see also B.6 of Appendix B and C.5.10 of Appendix C to ISO 1831).
- 18.11 *VOIDS.* The value of “d” as defined in ISO 1831 (5.4.5.9) shall be equal to 0.4 at the reading surface.
- 18.12 *Line separation.* See Appendix 3 to Section V for the td1 and to Section VI for the td2.
- 18.13 *Line spacing.* See Appendix 3 to Section V for the td1 and to Section VI for the td2.
- 18.14 *Skew.* The provisions relating to skew shall be as follows.
- 18.14.1 *Skew of MRZ characters.* The skew of individual MRZ characters on the MRtd shall not exceed 3 degrees measured from the reference edge.
- 18.14.2 *Skew of the MRZ lines.* The effect of the actual skew of the MRZ lines and the actual skew of the MRZ characters shall not exceed the limit specified in 18.14.1 nor shall the skew of MRZ or character misalignment result in the MRZ lines or any part thereof appearing outside the printing zone as defined in Section V for the td1 and in Section VI for the td2.
- 18.15 *Position of print within the ERZ.* The MRZ lines (three lines on the td1 and two lines on the td2) shall appear within the effective reading zone as defined in Appendix 4 to this Section.

**MRtds with additional data storage and biometric capability**

19. Doc 9303, Part 3, Volume 2 contains specifications for increasing the data storage capacity and global interoperability of an MRtd by the incorporation of a contactless integrated circuit into the structure of the MRtd. The resulting extra data capacity may be used for various purposes including the mandatory storage of a globally interoperable image of the face of the holder for use as the input into facial recognition systems. Optionally, fingerprint and/or iris images may also be stored as secondary globally interoperable biometrics.

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## APPENDIX 1 to Section IV

### THREE-LETTER CODES

(based on Alpha-3 codes for entities specified in ISO 3166-1,  
 with extensions for certain States being identified by an asterisk)

#### Part A — Codes for designation of nationality, place of birth or issuing State/authority

<i>Entity (short name)</i>	<i>Code</i>	<i>Entity (short name)</i>	<i>Code</i>
Afghanistan	AFG	Burundi	BDI
Åland Islands	ALA	Cambodia	KHM
Albania	ALB	Cameroon	CMR
Algeria	DZA	Canada	CAN
American Samoa	ASM	Cape Verde	CPV
Andorra	AND	Cayman Islands	CYM
Angola	AGO	Central African Republic	CAF
Anguilla	AIA	Chad	TCD
Antarctica	ATA	Chile	CHL
Antigua and Barbuda	ATG	China	CHN
Argentina	ARG	Christmas Island	CXR
Armenia	ARM	Cocos (Keeling) Islands	CCK
Aruba	ABW	Colombia	COL
Australia	AUS	Comoros	COM
Austria	AUT	Congo	COG
Azerbaijan	AZE	Cook Islands	COK
Bahamas	BHS	Costa Rica	CRI
Bahrain	BHR	Côte d'Ivoire	CIV
Bangladesh	BGD	Croatia	HRV
Barbados	BRB	Cuba	CUB
Belarus	BLR	Cyprus	CYP
Belgium	BEL	Czech Republic	CZE
Belize	BLZ	Democratic People's Republic of Korea	PRK
Benin	BEN	Democratic Republic of the Congo	COD
Bermuda	BMU	Denmark	DNK
Bhutan	BTN	Djibouti	DJI
Bolivia	BOL	Dominica	DMA
Bosnia and Herzegovina	BIH	Dominican Republic	DOM
Botswana	BWA	Ecuador	ECU
Bouvet Island	BVT	Egypt	EGY
Brazil	BRA	El Salvador	SLV
British Indian Ocean Territory	IOT	Equatorial Guinea	GNQ
Brunei Darussalam	BRN	Eritrea	ERI
Bulgaria	BGR		
Burkina Faso	BFA		



<i>Entity (short name)</i>	<i>Code</i>	<i>Entity (short name)</i>	<i>Code</i>
Estonia	EST	Jersey	JEY
Ethiopia	ETH	Jordan	JOR
Falkland Islands (Malvinas)	FLK <sup>4</sup>	Kazakhstan	KAZ
Faroe Islands	FRO	Kenya	KEN
Fiji	FJI	Kiribati	KIR
Finland	FIN	Kuwait	KWT
France	FRA	Kyrgyzstan	KGZ
France, Metropolitan	FXX	Lao People's Democratic	
French Guiana	GUF	Republic	LAO
French Polynesia	PYF	Latvia	LVA
French Southern Territories	ATF	Lebanon	LBN
Gabon	GAB	Lesotho	LSO
Gambia	GMB	Liberia	LBR
Georgia	GEO	Libyan Arab Jamahiriya	LBY
Germany	D	Liechtenstein	LIE
Ghana	GHA	Lithuania	LTU
Gibraltar	GIB	Luxembourg	LUX
Greece	GRC	Macau Special Administrative	
Greenland	GRL	Region of China	MAC
Grenada	GRD	Madagascar	MDG
Guadeloupe	GLP	Malawi	MWI
Guam	GUM	Malaysia	MYS
Guatemala	GTM	Maldives	MDV
Guernsey	GGY	Mali	MLI
Guinea	GIN	Malta	MLT
Guinea-Bissau	GNB	Marshall Islands	MHL
Guyana	GUY	Martinique	MTQ
Haiti	HTI	Mauritania	MRT
Heard and McDonald Islands	HMD	Mauritius	MUS
Holy See (Vatican City State)	VAT	Mayotte	MYT
Honduras	HND	Mexico	MEX
Hong Kong Special Administrative		Micronesia	
Region of China	HKG	(Federated States of)	FSM
Hungary	HUN	Moldova	MDA
Iceland	ISL	Monaco	MCO
India	IND	Mongolia	MNG
Indonesia	IDN	Montenegro	MNE
Iran (Islamic Republic of)	IRN	Montserrat	MSR
Iraq	IRQ	Morocco	MAR
Ireland	IRL	Mozambique	MOZ
Isle of Man	IMN	Myanmar	MMR
Israel	ISR	Namibia	NAM
Italy	ITA	Nauru	NRU
Jamaica	JAM	Nepal	NPL
Japan	JPN	Netherlands	NLD
		Netherlands Antilles	ANT
		Neutral Zone	NTZ
		New Caledonia	NCL
		New Zealand	NZL
		Nicaragua	NIC

<sup>4</sup> A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

<i>Entity (short name)</i>	<i>Code</i>	<i>Entity (short name)</i>	<i>Code</i>
Niger	NER	Svalbard and Jan Mayen Islands	SJM
Nigeria	NGA	Swaziland	SWZ
Niue	NIU	Sweden	SWE
Norfolk Island	NFK	Switzerland	CHE
Northern Mariana Islands	MNP	Syrian Arab Republic	SYR
Norway	NOR	Taiwan, Province of China	TWN
Oman	OMN	Tajikistan	TJK
Pakistan	PAK	Thailand	THA
Palau	PLW	The former Yugoslav Republic of Macedonia	MKD
Palestinian Territory, Occupied	PSE	Timor-Leste	TLS
Panama	PAN	Togo	TGO
Papua New Guinea	PNG	Tokelau	TKL
Paraguay	PRY	Tonga	TON
Peru	PER	Trinidad and Tobago	TTO
Philippines	PHL	Tunisia	TUN
Pitcairn	PCN	Turkey	TUR
Poland	POL	Turkmenistan	TKM
Portugal	PRT	Turks and Caicos Islands	TCA
Puerto Rico	PRI	Tuvalu	TUV
Qatar	QAT	Uganda	UGA
Republic of Korea	KOR	Ukraine	UKR
Réunion	REU	United Arab Emirates	ARE
Romania	ROU	United Kingdom British	
Russian Federation	RUS	— Citizen	GBR
Rwanda	RWA	— Dependent territories citizen	GBD*
St. Helena	SHN	— National (Overseas)	GBN*
Saint Kitts and Nevis	KNA	— Overseas citizen	GBO*
Saint Lucia	LCA	— Protected person	GBP*
Saint Pierre and Miquelon	SPM	— Subject	GBS*
Saint Vincent and the Grenadines	VCT	United Republic of Tanzania	TZA
Samoa	WSM	United States	USA
San Marino	SMR	United States Minor Outlying Islands	UMI
Sao Tome and Principe	STP	Uruguay	URY
Saudi Arabia	SAU	Uzbekistan	UZB
Senegal	SEN	Vanuatu	VUT
Serbia	SRB	Vatican City State (Holy See)	VAT
Seychelles	SYC	Venezuela	VEN
Sierra Leone	SLE	Viet Nam	VNM
Singapore	SGP	Virgin Islands (British)	VGB
Slovakia	SVK	Virgin Islands (U.S.)	VIR
Slovenia	SVN	Wallis and Futuna Islands	WLF
Solomon Islands	SLB	Western Sahara	ESH
Somalia	SOM	Yemen	YEM
South Africa	ZAF	Zambia	ZMB
South Georgia and the South Sandwich Islands	SGS	Zimbabwe	ZWE
Spain	ESP		
Sri Lanka	LKA		
Sudan	SDN		
Suriname	SUR		

**Part B — Codes for use in United Nations travel documents**

- \*UNO — Designates the United Nations Organization or one of its officials.
- \*UNA — Designates a specialized agency of the United Nations or one of its officials.
- \*UNK — Designates a resident of Kosovo to whom a travel document has been issued by the United Nations Interim Administration Mission in Kosovo (UNMIK).

**Part C — Codes for other issuing authorities**

- \*XOM — Designates the Sovereign Military Order of Malta or one of its emissaries.
- \*XCC — Designates the Caribbean Community or one of its emissaries.

**Part D — Codes for persons without a defined nationality**

- \*XXA — Stateless person, as defined in Article 1 of the 1954 Convention Relating to the Status of Stateless Persons.
- \*XXB — Refugee, as defined in Article 1 of the 1951 Convention Relating to the Status of Refugees as amended by the 1967 Protocol.
- \*XXC — Refugee, other than as defined under the code XXB above.
- \*XXX — Person of unspecified nationality, for whom the issuing State does not consider it necessary to specify any of the codes XXA, XXB or XXC above, whatever that person's status may be. This category may include a person who is neither stateless nor a refugee but who is of unknown nationality and legally residing in the State of issue.

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\* The codes listed in this Appendix are based on the Alpha-3 codes for entities specified and regularly updated in ISO 3166-1, with extensions for certain States and organizations being identified by an asterisk. The current version of the code may be obtained from the ISO 3166 maintenance agency (ISO 3166/MA), ISO's focal point for country codes.

## APPENDIX 2 to Section IV

### TRANSLITERATIONS RECOMMENDED FOR USE BY STATES

#### A. Transliteration of multinational characters

<i>Sequence number</i>	<i>National character</i>	<i>Description</i>	<i>Recommended transliteration</i>
1	Á	A acute	A
2	À	A grave	A
3	Â	A circumflex	A
4	Ä	A diaeresis	AE
5	Ã	A tilde	A
6	Ă	A breve	A
7	Å	A ring	AA
8	Ā	A macron	A
9	Ą	A ogonek	A
10	Ć	C acute	C
11	Ĉ	C circumflex	C
12	Č	C caron	C
13	Ċ	C dot accent	C
14	Ç	C cedilla	C
15	Ð	Eth	D
16	Ď	D caron	D
17	É	E acute	E
18	È	E grave	E
19	Ê	E circumflex	E
20	Ë	E diaeresis	E
21	Ě	E caron	E
22	Ė	E dot accent	E
23	Ē	E macron	E
24	Ę	E ogonek	E
25	Ĕ	E breve	E
26	Ĝ	G circumflex	G
27	Ğ	G breve	G
28	Ġ	G dot accent	G
29	Ç	G cedilla	G
30	Ĥ	H bar	H

<i>Sequence number</i>	<i>National character</i>	<i>Description</i>	<i>Recommended transliteration</i>
31	Ĥ	H circumflex	H
32	ı	I without dot (Turkey)	I
33	Í	I acute	I
34	Ì	I grave	I
35	Î	I circumflex	I
36	Ï	I diaeresis	I
37	Ĩ	I tilde	I
38	İ	I dot accent	I
39	Ī	I macron	I
40	Ĳ	I ogonek	I
41	Ĳ̆	I breve	I
42	Ĵ	J circumflex	J
43	Ƙ	K cedilla	K
44	Ł	L slash	L
45	Ł́	L acute	L
46	Ł̇	L caron	L
47	Ł̣	L cedilla	L
48	Ł̆	L dot	L
49	Ń	N acute	N
50	Ñ	N tilde	N or NXX
51	Ñ̇	N caron	N
52	Ŋ	N cedilla	N
53	η	Eng	N
54	Ø	O slash	OE
55	Ó	O acute	O
56	Ò	O grave	O
57	Ô	O circumflex	O
58	Ö	O diaeresis	OE
59	Õ	O tilde	O
60	Ő	O double acute	O
61	Ō	O macron	O
62	Ŏ	O breve	O
63	Ŕ	R acute	R
64	Ř	R caron	R
65	Ŗ	R cedilla	R
66	Ŝ	S acute	S
67	Ŝ̆	S circumflex	S

<i>Sequence number</i>	<i>National character</i>	<i>Description</i>	<i>Recommended transliteration</i>
68	Š	S caron	S
69	Ş	S cedilla	S
70	Ʀ	T bar	T
71	ř	T caron	T
72	Ț	T cedilla	T
73	Ú	U acute	U
74	Ù	U grave	U
75	Ô	U circumflex	U
76	Ü	U diaeresis	UE or UXX
77	Û	U tilde	U
78	Ŭ	U breve	U
79	ǚ	U double acute	U
80	Ů	U ring	U
81	Ū	U macron	U
82	Ų	U ogonek	U
83	Ŵ	W circumflex	W
84	Ý	Y acute	Y
85	Ŷ	Y circumflex	Y
86	ÿ	Y diaeresis	Y
87	Ž	Z acute	Z
88	Ž	Z caron	Z
89	Ž	Z dot	Z
90	Þ	Thorn (Iceland)	TH
91	Æ	ligature AE	AE
92	Ĳ	ligature IJ	IJ
93	Œ	ligature OE	OE
94	ß	double s (Germany)	SS

#### B. Transliteration of Cyrillic characters

<i>Sequence number</i>	<i>National character</i>	<i>Recommended transliteration</i>
1	А	A
2	Б	B
3	В	V
4	Г	G (except Belorussian and Serbian = H)
5	Д	D
6	Е	E

<i>Sequence number</i>	<i>National character</i>	<i>Recommended transliteration</i>
7	Ё	E (except Belorussian = IO)
8	Ж	ZH (except Serbian = Z)
9	З	Z
10	И	I (except Ukrainian = Y)
11	І	I
12	Й	I
13	К	K
14	Л	L
15	М	M
16	Н	N
17	О	O
18	П	P
19	Р	R
20	С	S
21	Т	T
22	У	U
23	Ф	F
24	Х	KH (except Serbian and in the language spoken in the former Yugoslav Republic of Macedonia = H)
25	Ц	TS (except Serbian and in the language spoken in the former Yugoslav Republic of Macedonia = C)
26	Ч	CH (except Serbian = C)
27	Ш	SH (except Serbian = S)
28	Щ	SHCH (except Bulgarian = SHT)
29	Ы	Y
30	Ъ	IE
31	Э	E
32	Ю	IU
33	Я	IA
34	Ѧ	Y
35	Ґ	G
36	ӱ	U
37	Ү	U
38	ƒ	G (except in the language spoken in the former Yugoslav Republic of Macedonia = GJ)

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<i>Sequence number</i>	<i>National character</i>	<i>Recommended transliteration</i>
39	Ѓ	D
40	С	DZ
41	Ј	J
42	Ќ	K (except in the language spoken in the former Yugoslav Republic of Macedonia = KJ)
43	Љ	LJ
44	Њ	NJ
45	н	C
46	џ	DZ (except in the language spoken in the former Yugoslav Republic of Macedonia = DJ)
47	Е	IE
48	Ї	I

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**APPENDIX 3 to Section IV****SUBSET OF OCR-B CHARACTERS FROM ISO 1073-2  
FOR USE IN MACHINE READABLE TRAVEL DOCUMENTS**

(constant stroke width)

(for illustrative purposes only)

**1. Machine readable zone (MRZ)**

Only the following characters shall appear in the MRZ.

0 1 2 3 4 5 6 7 8 9  
A B C D E F G H I  
J K L M N O P Q R  
S T U V W X Y Z <

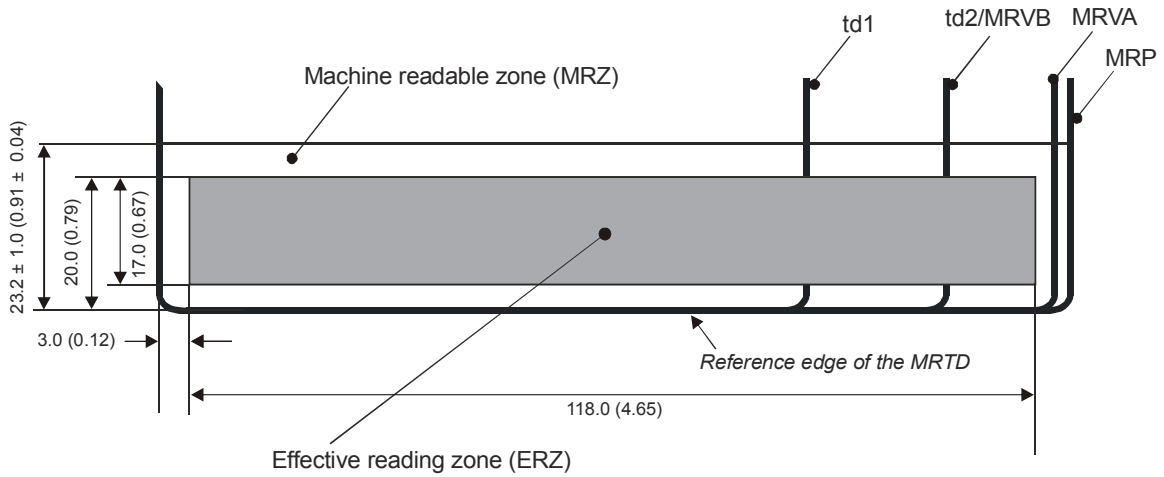
The above characters are shown larger than actual size. The typeface required in the MRZ on MRTDs is OCR-B, size 1, constant stroke width with a character width spacing of 2.54 mm (0.10 in), i.e. a horizontal printing density of 10 characters per 25.4 mm (1.0 in).

**2. Visual inspection zone (VIZ)**

The typeface and type size used within the VIZ is at the discretion of the issuing State or organization, although use of OCR-B, size 1, is preferred. Irrespective of typeface used, the printing density should not exceed 15 characters per 25.4 mm (1.0 in).

### APPENDIX 4 to Section IV

## SCHMATIC DIAGRAM OF THE MRTD EFFECTIVE READING ZONE



Dimensions in millimetres  
(inch dimensions in parentheses)

Not to scale

*Note.—The dimensions of the effective reading zone (ERZ) illustrated are based on a standardized ERZ for all machine readable travel documents to allow use of a single machine reader.*

## **APPENDIX 5 to Section IV**

### **ILLUSTRATIVE GUIDELINES FOR PORTRAITS IN AN MRTD**

The illustrations on the following pages provide guidance for the taking of photographs to be used as the portrait of the holder in an MRTD and should be viewed in relation to paragraph 6 of Section IV and paragraph 10 in Section V for the td1 or paragraph 10 in Section VI for the td2.

#### **1. Pose**

- 1.1 The photograph shall have been taken less than six months from the application date.
- 1.2 It shall show a close up of the head and shoulders.
- 1.3 The photograph shall be taken so that an imaginary horizontal line between the centres of the eyes is parallel to the top edge of the picture.
- 1.4 The face shall be in sharp focus and clear with no blemishes such as ink marks or creases.
- 1.5 The photograph shall show the subject facing square on and looking directly at the camera with a neutral expression and the mouth closed.
- 1.6 The chin to crown (crown is the position of the top of the head if there were no hair) shall be 70 to 80 per cent of the vertical height of the picture.
- 1.7 The eyes must be open and there must be no hair obscuring them.
- 1.8 If the subject wears glasses, the photograph must show the eyes clearly with no lights reflected in the glasses. The glasses shall not have tinted lenses. Avoid heavy frames if possible and ensure that the frames do not cover any part of the eyes.
- 1.9 Coverings, hair, headdress or facial ornamentation which obscure the face are not permitted.
- 1.10 The photograph must have a plain, light-coloured background.
- 1.11 There must be no other people or objects in the photograph.

#### **2. Lighting, exposure and colour balance**

- 2.1 The lighting must be uniform with no shadows or reflections on the face or in the background.
- 2.2 The subject's eyes must not show red eye.

2.3 The photograph must have appropriate brightness and contrast.

2.4 Where the picture is in colour, the lighting and photographic process must be colour balanced to render skin tones faithfully.

### **3. Submission of portrait to the issuing authority**

3.1 Where the portrait is supplied to the issuing authority in the form of a print, the photograph, whether produced using conventional photographic techniques or digital techniques, should be on good or photo-quality paper and should be of the maximum specified dimensions.

3.2 Where the portrait is supplied to the issuing authority in digital form, the requirements specified by the issuing authority must be adhered to.

### **4. Compliance with international standards**

4.1 The photograph shall comply with the appropriate definitions set out in ISO/IEC 19794-5.



## PORTRAIT QUALITY

The portrait shall be not more than 6 months old.

It shall be 35 x 45 mm (1.38 x 1.77 in) in width and height. The issuing State will scale the portrait to a size suitable for the td1 or the td2. The portrait shall show a close-up of the applicant's head and the top of the shoulders. The face should take up 70-80 per cent of the vertical dimension of the picture.

The portrait must be in sharp focus, of high quality with no creases or ink marks.

The portrait must show the applicant looking directly at the camera. It should have appropriate brightness and contrast. If in colour, it should show skin tones naturally.

If submitted as a print, it should be on high quality paper with high resolution.

Portraits taken with a digital camera should be at high quality and resolution and be printed on photo-quality paper.



## STYLE AND LIGHTING

The portrait shall be colour neutral showing the applicant with the eyes open and clearly visible; there must be no hair obscuring the eyes. The applicant must be shown facing square to the camera, not looking over one shoulder (portrait style).

The head should be upright so that an imaginary horizontal line drawn between the centres of the eyes is parallel to the top edge of the picture.

Both edges of the face must be clearly visible.

The background shall be plain and light coloured.

The lighting shall be uniform with no shadows and no reflections on the face.

There shall be no red-eye.



## GLASSES AND HEAD COVERS

### Glasses:

The portrait shall show the eyes clearly with no light reflection off the glasses and no tinted lenses. If possible, avoid heavy frames. The frames must not cover any part of the eyes.

### Head coverings:

Head coverings shall not be accepted except in circumstances which the competent State authority specifically approves. Such circumstances may be religious, medical or cultural.

## EXPRESSION AND FRAME

The portrait shall show the applicant alone with no other people, chair backs or toys visible. The applicant shall be looking at the camera with a neutral expression and the mouth closed.

## V. TECHNICAL SPECIFICATIONS UNIQUE TO SIZE 1 MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS

### Scope

1. This section defines those specifications which are unique to size 1 machine readable official travel documents (td1) and are necessary for global interoperability. The td1 specification may also be used as the format for a passport card, as described in Doc 9303, Part 1, Section IV. Additional specifications for a biometrically-enabled td1 with data storage on a contactless integrated circuit are published in Doc 9303, Part 3, Volume 2.

### Dimensions of the td1

2. The dimensions shall be as follows:

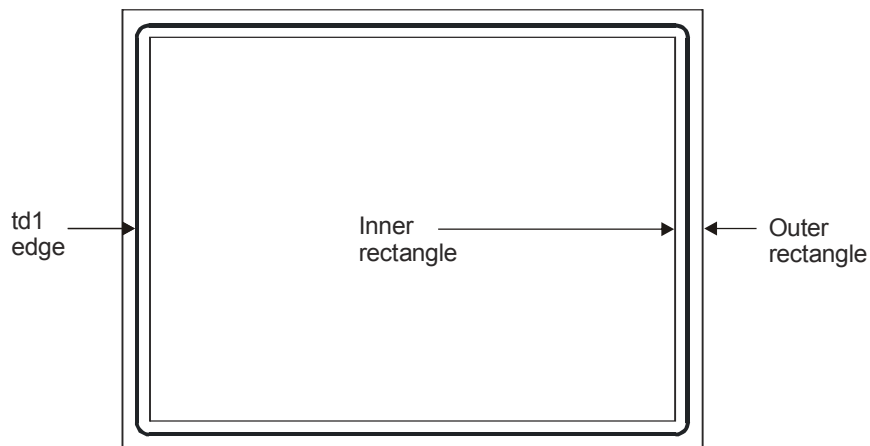
2.1 *Nominal dimensions.* The nominal dimensions shall be those specified in ISO/IEC 7810 for the ID-1 type card:

53.98 mm × 85.6 mm (2.13 in × 3.37 in).

2.2 *Edge tolerances.* The edges of the document after final preparation shall be within the area circumscribed by the following concentric rectangles as illustrated in Figure V-1.

Inner rectangle: 53.25 mm × 84.85 mm (2.10 in × 3.34 in)

Outer rectangle: 54.75 mm × 86.35 mm (2.16 in × 3.40 in).



Not to scale

Figure V-1. td1 dimensional illustration



In no event shall the dimensions of the finished td1 document exceed the dimensions of the outer rectangle, including any final preparation (e.g. laminate edges).

2.3 *Margins.* The dimensional specifications refer to the outer limits of the td1. A margin of 2.0 mm (0.08 in) along each outer edge, with the exception of the header zone, must be left clear of data.

2.4 *Thickness.* The thickness, including any final preparation (e.g. laminate), shall be as follows.

2.4.1 Minimum: 0.25 mm (0.01 in).

2.4.2 Maximum: 1.25 mm (0.05 in).

2.4.3 The thickness of the area within the machine readable zone shall not vary by more than 0.1 mm (0.004 in).

*Note.— The tolerances specified above differ from those specified in ISO/IEC 7810 for the ID-1 size card. This is for historical reasons; td1 cards were originally produced using encapsulated pouch card methods which are incapable of achieving the permitted tolerances of ISO/IEC 7810. Some cards may still be produced using these techniques and others where the personalization process renders it impractical to achieve ISO/IEC 7810 tolerances. Wherever possible, however, dimensions and tolerances should conform to ISO/IEC 7810.*

*General note.— The decimal notation used in these specifications conforms to ICAO practice. The ISO practice is to use a decimal point (.) in imperial measurements and a comma (,) in metric measurements.*

### Layout

3. The td1 follows a standardized layout to facilitate reading of data globally by eye and machine readable means.

3.1 To accommodate the various requirements of States' laws and practices and to achieve the maximum standardization within those divergent requirements, the td1 is divided into the seven zones specified in Section IV located as follows:

#### *Front of the td1*

Zone I	Mandatory header
Zone II	Mandatory and optional personal data elements
Zone III	Mandatory and optional document data elements
Zone IV	Mandatory holder's signature or usual mark
Zone V	Mandatory identification feature

#### *Back of the td1*

Zone VI	Optional data elements
Zone VII	Mandatory machine readable zone (MRZ)

3.2 Zones I to V and Zone VII contain mandatory elements which represent the minimum requirements for the td1. The optional elements in Zones II, III and VI accommodate the diverse requirements of issuing States and organizations, allowing for presentation of additional data at the discretion of the issuing State or organization, while achieving the desired level of standardization. The location of zones and standard

sequence for data elements are set out in Appendix 1 to this section. Appendix 2 to this section illustrates the dimensional specifications for the td1. Appendix 4 to this section outlines the guidelines for positioning and adjusting the dimensional specifications of Zones I to V to accommodate the flexibility desired by issuing States and organizations. Examples of a personalized td1 are shown in Appendix 5 to this section.

### 3.3 Zone V — Position of the holder's portrait

3.3.1 The standard position for the holder's portrait is along the left edge of the front of the td1, as described in 5.3.4 and 5.3.5 of Section IV and illustrated in Example 2 of Appendix 4.

3.3.2 When an issuing State or organization chooses, for its own bilateral purposes, to expand the machine readable data capacity of a td1 through use of an integrated circuit with contacts, the holder's portrait (Zone V) shall be relocated such that its right edge is coincident with the right edge of the front of the td1. Zones II, III and IV shall in turn be relocated to have their left edge coincident with the left edge of the front of the td1. The specifications for Zones II through IV are similar to those defined in paragraph 5 of Section IV, but adjusted to accommodate the relocation of the portrait to the right and to avoid the area containing the contacts of the IC as defined by ISO/IEC 7816-2.

3.3.3 The size of the portrait is given in item 13/V of 5.1.

## Content and use of zones

4. The content and use of zones and the flexibility available to adjust the relative size and location of zones is specified in Section IV, paragraph 5. Examples indicating the flexibility appear in Appendices 4 and 5 to this Section.

## Detailed layout

5. *Visual inspection zone (VIZ) (Zones I to VI)*. All data in the VIZ shall be clearly legible.

5.1 *Data element directory*. The data elements in the VIZ are specified as follows.

### Visual inspection zone — data element directory

<i>Field/ zone no.</i>	<i>Data element</i>	<i>Specifications</i>	<i>Maximum no. of character positions</i>	<i>References and notes*</i>
01/I	Issuing State or organization	State or organization responsible for issuing the document. This should be printed, the type font being selected at the discretion of the issuing State or organization. A translation of the name into one or more languages, one of which should be English, French or Spanish, should be given when the translated name is more familiar to the international community.	Variable	Notes a, c, e, h, i
02/I	Document	The type or designation of the document.	Variable	Notes a, b, c, e, i

<i>Field/ zone no.</i>	<i>Data element</i>	<i>Specifications</i>	<i>Maximum no. of character positions</i>	<i>References and notes*</i>
03/04/II	Name	<p>The full name of the holder, as identified by the issuing State or organization. The name shall be divided, where possible, by the issuing State into two parts, the first representing that portion of the name that the issuing State or organization defines as the "primary identifier" for the holder (e.g. surname, maiden name plus married name, family name) and the second representing all remaining components (e.g. given names, initials) of the holder's name, which the issuing State or organization considers as collectively representing a "secondary identifier." The two parts, i.e. primary and secondary identifiers, once integrated, constitute the name of the document holder.</p> <p>When the issuing State or organization determines that the holder's name cannot be divided into the required two parts, as defined above, the full name of the holder shall be defined as the primary identifier.</p>	Variable	Section IV, 10; Notes a, c, i, l
03/II	Primary identifier	Predominant component(s) of the name of the holder as described above. In cases where the predominant component(s) of the name of the holder (e.g. where this consists of composite names) cannot be shown in full or in the same order, owing to space limitations of Field(s) 03 and/or 04 or national practice, the most important component(s) (as determined by the State or organization) of the primary identifier shall be inserted.	Variable	Section IV, 10; Notes a, c, i, l
04/II	Secondary identifier	Secondary component(s) of the name of the holder, as described above. The most important component(s) (as determined by the State or organization) of the secondary identifier of the holder shall be inserted in full, up to the maximum dimensions of the field frame. Other components, where necessary, may be represented by initials. Where the holder's name has only predominant component(s), this data field shall be left blank. The State or organization may optionally utilize the whole zone comprising Fields 03 and 04 as a single field. In such a case the primary identifier shall be placed first, followed by a comma and a space, followed by the secondary identifier.	Variable	Section IV, 10; Notes a, c, i, l
05/II	Sex	Sex of the holder, to be specified by use of the single initial commonly used in the language of the State or organization where the document is issued and, if translation into English, French or Spanish is necessary, followed by an oblique and the capital letter F for female, M for male, or X for unspecified.	3	Notes a, c, f, i, l

<i>Field/ zone no.</i>	<i>Data element</i>	<i>Specifications</i>	<i>Maximum no. of character positions</i>	<i>References and notes*</i>
06/II	Nationality	In accordance with the codes in Section IV, Appendix 1.	3	Notes a, h, l
07/II	Date of birth	Holder's date of birth as recorded by the issuing State or organization. For unknown dates see Section IV, 14.1.7.	15	Section IV, 14.1; Notes a, b, c, i, l
08/II Optional element in mandatory zone	Optional personal data elements	Optional personal data elements, e.g. personal identification number or fingerprint, at the discretion of the issuing State or organization. If a fingerprint is included in this field, it should be presented as a 1:1 representation of the original. If a date is included, it shall follow the form of presentation described in Section IV, 14.1.	Variable	Notes a, b, c, d, g, i
09/III	Document number	As given by the issuing State or organization, to uniquely identify the document.	Variable	Notes a, b, c, i, j, l
10/III	Date of expiry	Date of expiry of the document.	15	Section IV, 14.1; Notes a, b, c, i, l
11/III Optional element in mandatory zone	Optional document data elements	Optional data elements relating to the document, e.g. date or place of issue, at the discretion of the issuing State or organization.	Variable	Notes a, b, c, d, g, i
12/IV	Holder's signature or usual mark	Signature or usual mark of the holder.		Section IV, 6.2; Note e
13/V	Identification feature	<p>This field shall contain a portrait of the holder. The portrait shall not be larger than 45.0 mm × 35.0 mm (1.77 in × 1.38 in) nor smaller than 32.0 mm × 26.0 mm (1.26 in × 1.02 in). The position of the field concerned shall be aligned to the left of Zones II and III except where a State chooses to incorporate an integrated circuit with contacts (See paragraph 3.3.2 to this section).</p> <p>At the option of the issuing State or organization, this field may contain another identifier or security feature provided this does not obscure the portrait.</p> <p>See Section IV, 6 for additional specifications for the portrait.</p> <p>A single digit fingerprint, if included, shall conform with the specifications defined in Section IV, 6.3.</p>		Section IV, 6; Note e
14/VI	Optional data elements	Additional optional data elements at the discretion of the issuing State or organization.		Notes a, b, c, d, g, i

## 6. Machine readable zone (MRZ) (Zone VII)

6.1 *MRZ position.* The MRZ is located on the back of the td1. Appendix 3 to this section shows the nominal dimensions and position of the data in the MRZ.

6.2 *Data elements.* The data elements corresponding to specified fields of the visual inspection zone shall be printed in machine readable form, in the MRZ, beginning with the left most character position in each field in the sequence indicated in the data structure specifications for each document. Appendix 6 to this section indicates the structure of the MRZ.

6.3 *Print specifications.* Machine readable data shall be printed in OCR-B type font, size 1, constant stroke width, as specified in Section IV, 9.4.4. The MRZ shall be printed with a line spacing as defined in Appendix 3 to this section and a horizontal printing density of 10 characters per 25.4 mm (1.0 in).

6.4 *Print position.* The position of the left-hand edge of the first character shall be  $5.0 \pm 1.0$  mm ( $0.20 \pm 0.04$  in) from the left-hand edge of the document. Reference centre lines for the OCR lines and a nominal starting position for the first character of each line are shown in Appendix 3 to this section. The positioning of the characters is indicated by those reference lines and by the printing zones of the three code lines in Appendix 3 to this section.

### Data structure of machine readable data for the td1

#### 6.5 Data structure of the upper machine readable line

<i>MRZ character positions (line 1)</i>	<i>Field no. in VIZ</i>	<i>Data element</i>	<i>Specifications</i>	<i>Number of characters</i>	<i>References and notes*</i>
1 to 2	02	Document code	Two characters, the first of which shall be A, C or I, shall be used to designate the particular type of document. The second character shall be as specified in Note k.	2	Notes a, b, c, e, k
3 to 5	01	Issuing State or organization	The three-letter code specified in Section IV, Appendix 1 shall be used. Spaces shall be replaced by filler characters (<).	3	Notes a, c, e
6 to 14	09	Document number	As given by the issuing State or organization, to uniquely identify the document. Spaces shall be replaced by filler characters (<).	9	Notes a, b, e, j
15		Check digit	See 8 and Section IV, 15.	1	Notes b, c, j
16 to 30	8, 11 or Zone VI	Optional data elements	For optional use. Unused character positions shall be completed with filler characters (<) repeated up to position 30 as required.	15	Notes a, b, c, e, j

6.6 Data structure of the middle machine readable line

MRZ character positions (line 2)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
1 to 6	07	Date of birth	The structure is YYMMDD, where: YY = year (2 positions) MM = month (2 positions) DD = day (2 positions).	6	Section IV, 13; Notes b, c, e
7		Check digit	See 8 and Section IV, 15.	1	Note b
8	05	Sex	F = female; M = male; < = nonspecified.	1	Notes a, c, e, f
9 to 14	10	Date of expiry	The structure is YYMMDD, where: YY = year (2 positions) MM = month (2 positions) DD = day (2 positions).	6	Section IV, 14; Notes b, e
15		Check digit	See 8 and Section IV, 15.	1	Note b
16 to 18	06	Nationality	In accordance with the codes in Section IV, Appendix 1. Spaces are replaced with filler characters (<).	3	Notes a, c, e, h
19 to 29	08, 11 or Zone VI	Optional data elements	For use of the issuing State or organization. Unused character positions shall be completed with filler characters (<) repeated up to position 29 as required.	11	Notes a, b, c, e
30		Overall check digit	Overall check digit to verify the data element of the upper and middle machine readable lines.  The final check digit is calculated on the basis of all figures shown on the upper and middle machine readable lines, including values for characters that are a part of the number fields and their check digits (character positions 6 – 30 of the upper machine readable line and character positions 1 – 7, 9 – 15 and 19 – 29 of the middle machine readable line).	1	8 and Section IV, 15; Note b

6.7 Data structure of the lower machine readable line

MRZ character positions (line 3)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
1 to 30	03, 04	Name	The name consists of primary and secondary identifiers which shall be separated by two filler characters (<<).	30 (Primary identifier(s),	Section IV, 11.1 and 11.2; Notes a, c, e

<i>MRZ character positions (line 3)</i>	<i>Field no. in VIZ</i>	<i>Data element</i>	<i>Specifications</i>	<i>Number of characters</i>	<i>References and notes*</i>
			Components within the primary or secondary identifiers shall be separated by a single filler character (<).	secondary identifier(s) and fillers)	
			When the name of the document holder has only one part, it shall be placed first in the character positions for the primary identifier, filler characters (<) being used to complete the remaining character positions of the MRZ.		
		Punctuation in the name	Representation of punctuation is not permitted in the MRZ.		Section IV, 11.9
		Apostrophes in the name	Components of the primary or secondary identifiers shall be combined, and no filler character (<) shall be inserted. Example: VIZ: D'ARTAGNAN MRZ: DARTAGNAN		Section IV, 11.9
		Hyphens in the name	Hyphens (-) in the name shall be converted to the filler character (<) (i.e. hyphenated names shall be represented as separate components). Example: VIZ: MARIE-ELISE MRZ: MARIE<ELISE		Section IV, 11.9
	04	Commas	Where a comma is used in the VIZ to separate the primary and secondary identifiers, the comma shall be omitted in the MRZ, and the primary and secondary identifiers shall be separated by two filler characters (<<).  Where a comma is used in the VIZ to separate two name components, it shall be represented in the MRZ by a single filler character (<).		Section IV, 11.9
		Name prefixes and suffixes	Prefixes and suffixes (such as Jr., Sr., II or III) shall not be included in the MRZ, except as permitted by Section IV, 11.7.		Section IV, 11.7
		Filler	When all components of the primary and secondary identifiers and required separators (filler characters) do not exceed 30 characters in total, all permitted name components shall be included in the MRZ, and all unused character positions shall be completed with filler characters (<) repeated up to position 30 as required.		Section IV, 11.3 to 11.5

<i>MRZ character positions (line 3)</i>	<i>Field no. in VIZ</i>	<i>Data element</i>	<i>Specifications</i>	<i>Number of characters</i>	<i>References and notes*</i>
		Truncation of the name	<p>When the primary and secondary identifiers and required separators (filler characters) exceed the number of character positions available for names (i.e. 30), they shall be truncated as follows:</p> <p>Characters shall be removed from one or more components of the primary identifier until three character positions are freed and two filler characters (&lt;&lt;) and the first character of the first component of the secondary identifier can be inserted. The last character (position 30) shall be an alphabetic character (A through Z). This indicates that truncation may have occurred.</p> <p>Further truncation of the primary identifier may be carried out to allow characters of the secondary identifier to be included, provided that the name field shall end with an alphabetic character (position 30). This indicates that truncation may have occurred.</p> <p>When the name consists of only a primary identifier which exceeds the number of character positions available for the name, i.e. 30, characters shall be removed from one or more components of the name until the last character in the name field is an alpha character.</p>		Section IV, 11.6; Section V, 6.8; Notes a, c, e

\*Notes for 5.1, 6.5, 6.6 and 6.7.

- a) Alphabetic characters (A–Z). National characters may be included in the VIZ (see Section IV, 8.3). In the MRZ only the characters defined in Appendix 3 to Section IV shall be used.
- b) Numeric characters (0–9). National numerals may be additionally included in the VIZ (see Section IV, 8.3). In the MRZ only the numerals 0–9 may be used as defined in Appendix 3 to Section IV.
- c) Punctuation may be included in the VIZ. In the MRZ only the filler character specified in Appendix 3 to Section IV may be used.
- d) Optional data elements may appear in Zone VI.
- e) The field caption is not printed on the document.
- f) Where a person does not wish his/her sex to be identified or where an issuing State or organization does not want to show this data, the filler character (<) shall be used in this field in the MRZ and an X in this field in the VIZ.
- g) The use of a caption to identify a field is at the option of the issuing State or organization.
- h) In the case of a document issued by the United Nations Organization, or one of its specialized agencies, to a designated official, the appropriate organization code is used in lieu of nationality. See Part B of Appendix 1 to Section IV.



- i) A blank space (or spaces) is included.
- j) The number of characters in the VIZ may be variable; however, if the document number has more than 9 characters, the 9 principal characters shall be shown in the MRZ in character positions 6 to 14. They shall be followed by a filler character instead of a check digit to indicate a truncated number. The remaining characters of the document number shall be shown at the beginning of the field reserved for optional data elements (character positions 16 to 30 of the upper machine readable line) followed by a check digit and a filler character.
- k) The first character shall be A, C or I. The second character shall be at the discretion of the issuing State or organization except that V shall not be used, and C shall not be used after A except in the crew member certificate. The designation 'IP' shall be used for a passport card.
- l) The field caption shall be printed on the document.

### Convention for writing the name of the holder

6.8 The basic rules for writing the name of the holder appear in Section IV, paragraph 10 for the VIZ and paragraph 11 for the MRZ. Where the name contains more characters than are available in the name field of the MRZ of the td1, it is necessary to truncate the name. The following methods provide a number of options available for use at the discretion of the issuing State.

#### 6.8.1 *Truncated names — secondary identifier truncated*

- a) One or more name components truncated to initials:  
 Name: Nilavadhanananda Chayapa Dejthamrong Krasuang  
 VIZ: NILAVADHANANANDA, CHAYAPA DEJTHAMRONG KRASUANG  
 MRZ (lower line): NILAVADHANANANDA<<CHAYAPA<DE<K
- b) One or more name components truncated:  
 Name: Nilavadhanananda Arnpol Petch Charonguang  
 VIZ: NILAVADHANANANDA, ARNPOL PETCH CHARONGUANG  
 MRZ (lower line): NILAVADHANANANDA<<ARNPOL<PE<CH

#### 6.8.2 *Truncated names — primary identifier truncated*

- a) One or more components truncated to initials:  
 Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (lower line): BENNELONG<WOOL00M00L00<W<W<<DI
- b) One or more components truncated:  
 Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (lower line): BENNELONG<WOOL00M<WA<WARN<<D<P
- c) One or more components truncated to a fixed number of characters:  
 Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (lower line): BENNE<WOOL0<WARRA<WARNA<<DIN<P

6.8.3 Names that just fit, indicating possible truncation by character in the last position of the name field, but which are not truncated

Name: Jonathon Alec Papandropoulos  
 VIZ: PAPANDROPOULOUS, JONATHON ALEC  
 MRZ (lower line): PAPANDROPOULOUS<<JONATHON<ALEC

Note.— Even though there is an alpha character in the 30th character position of this td1 lower machine readable line, this name has not been truncated, but it must be assumed that it has been truncated.

**Representation of the issuing State or organization and nationality of the holder in the MRZ and the VIZ**

7. Use of the three-letter codes listed in Appendix 1 to Section IV is mandatory in the MRZ. In the VIZ, the name of the issuing State should appear in full; the holder's nationality in the VIZ may either appear in full or in the form of the three-letter code. Specific locations are defined in the following table.

	Zone	Field no.	Character position no.	Number of character positions
Issuing State or organization	VIZ	01	—	Variable
	MRZ (upper line)		3 – 5	
Holder's nationality	VIZ	06	—	3
	MRZ (middle line)		16 – 18	

**Check digits in the MRZ**

8. The method of calculating check digits is given in Section IV, 15. For the td1, the data structure of the machine readable lines in 6.5 through 6.7 provides for the inclusion of four check digits as follows.

Check digit	Character positions (upper MRZ line) used to calculate check digit	Check digit position (upper MRZ line)
Document number check digit	6 – 14	15
Check digit	Character positions (middle MRZ line) used to calculate check digit	Check digit position (middle MRZ line)
Date of birth check digit	1 – 6	7
Date of expiry check digit	9 – 14	15

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<i>Check digit</i>	<i>Character positions (upper/middle MRZ line) used to calculate check digit</i>	<i>Check digit position (middle MRZ line)</i>
Composite check digit	6 – 30 (upper line), 1 – 7, 9 – 15, 19 – 29 (middle line) <i>Note.— Positions 1 – 5 (upper line), positions 8, 16 – 18 (middle line) and positions 1 – 30 (lower line) are excluded in calculating the composite check digit.</i>	30

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### Character sets and fonts

9. The character sets and fonts to be used in the td1 shall be as indicated hereunder.

#### 9.1 *Captions*

9.1.1 Captions shall be printed in a clear, linear type font in a size of 1.0 mm to 1.8 mm (0.04 in to 0.07 in).

9.1.2 Captions shall be in the language of the issuing State or organization. When such language uses the Latin alphabet, straight font style should be used to print the captions.

9.1.3 Where the language of the issuing State or organization is not English, French or Spanish, the printed caption as defined in Section IV, 8.4 shall be followed by an oblique character (/) and the equivalent of the caption in English, French or Spanish. An italic font style should be used for the second language.

*Note.— Where the language of the issuing State or organization is English, French or Spanish, the issuing State or organization should use one of the other two languages to print the caption following the oblique character (/).*

9.2 *Entered data in the VIZ.* See Section IV, 8.2.

9.3 *Entered data in the MRZ.* See Section IV, 9.4.

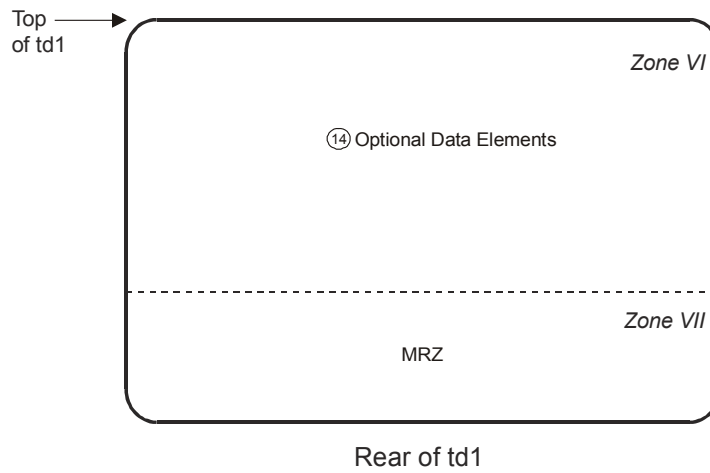
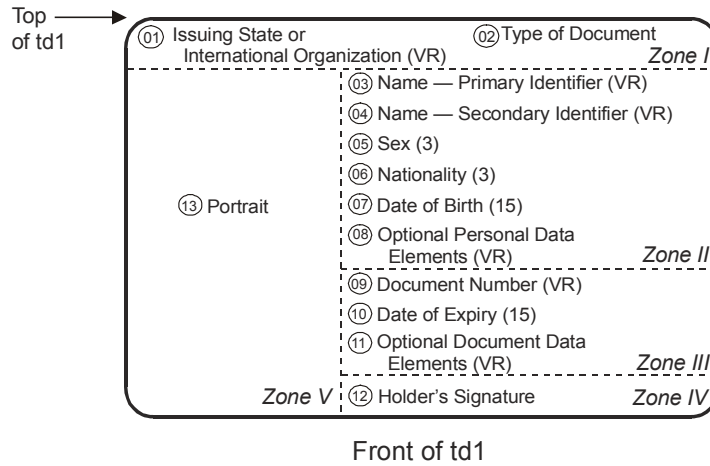
### Portrait

10. *Portrait.* A portrait, representing only the holder of the td1, shall occupy the rectangular area defined as Zone V as specified in the data element directory in 5.1 of this section and in 6 of Section IV.

10.1 The portrait may have irregular edges. When a digitally printed reproduction is used, the background of the portrait may be dropped out in order to provide protection against forgery or substitution.

**APPENDIX 1 to Section V**

**SEQUENCE OF DATA ELEMENTS FOR THE  
 SIZE-1 MRtd WITH MINIMUM MANDATORY FORMAT (td1)**



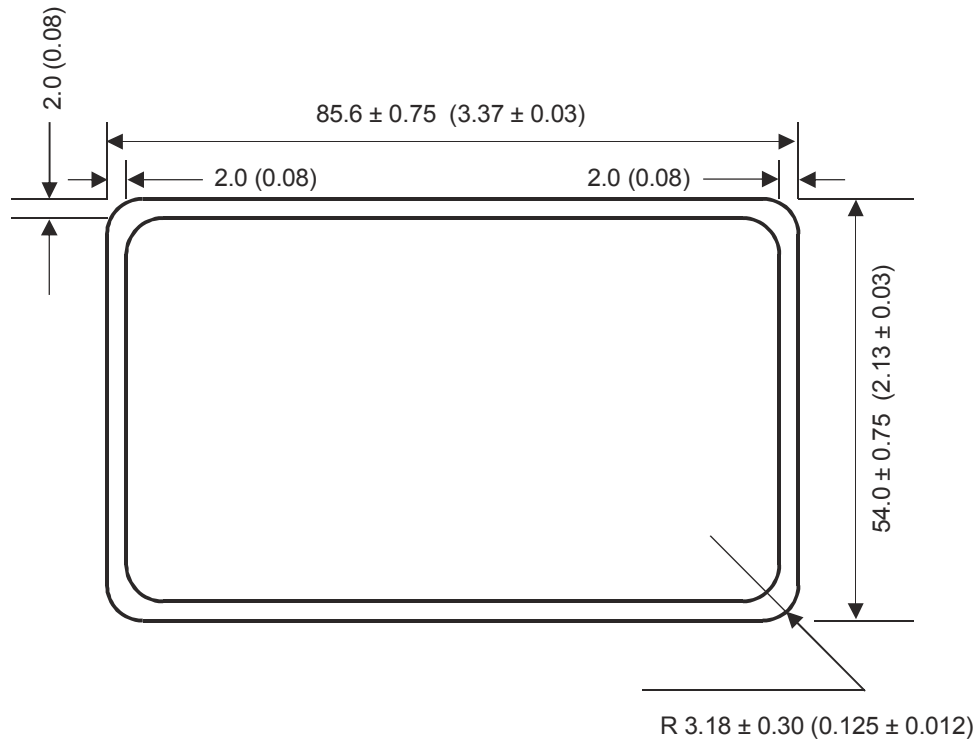
Not to scale

Notes.

1. For clarity, the above diagrams are shown enlarged from actual size.
2. (VR) = variable number of characters.
3. ( ) = maximum of fixed number of characters.
4. ○ = field number.
5. The borderlines of the zones are omitted in the actual document

APPENDIX 2 to Section V

SCHMATIC DIAGRAM OF  
SIZE-1 MRTD WITH MINIMUM MANDATORY FORMAT (td1)



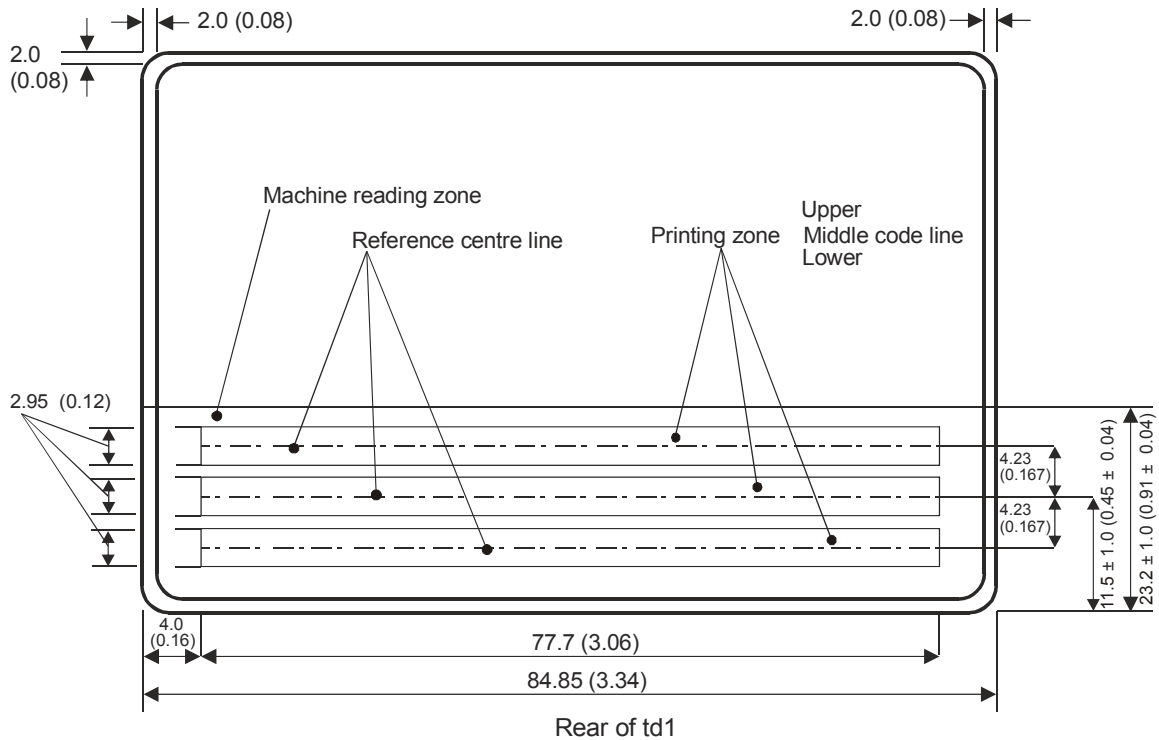
Nominal dimensions in millimetres  
(inch dimensions in parentheses)

R = Radius

Not to scale

APPENDIX 3 to Section V

**SCHEMATIC DIAGRAM OF MACHINE READABLE ZONE  
 OF A SIZE-1 MRtd WITH MINIMUM MANDATORY FORMAT (td1)**



Nominal dimensions in millimetres  
 (inch dimensions in parentheses)

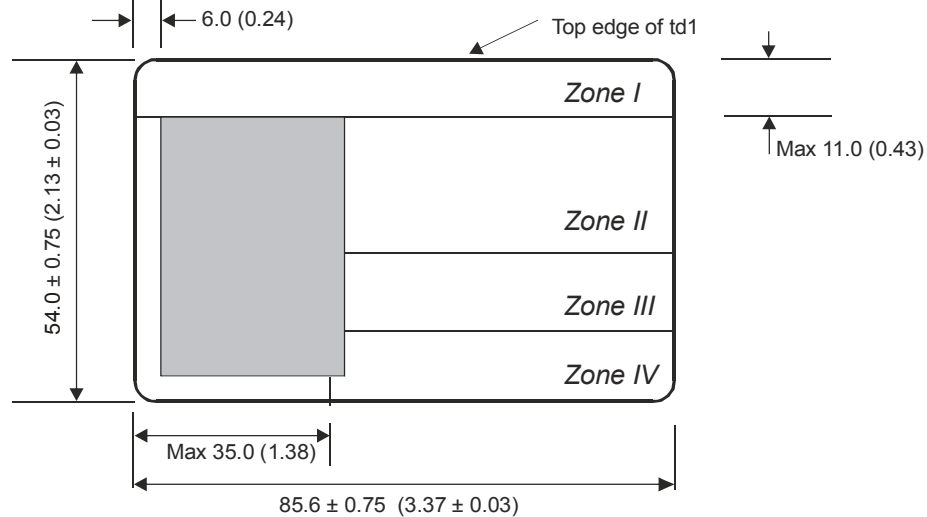
Not to scale

*Note.— For illustrative purposes, the smallest option for the 85.6 mm (3.37 in) dimension of the td1 and the smallest option for the left-hand margin in the MRZ have been selected.*

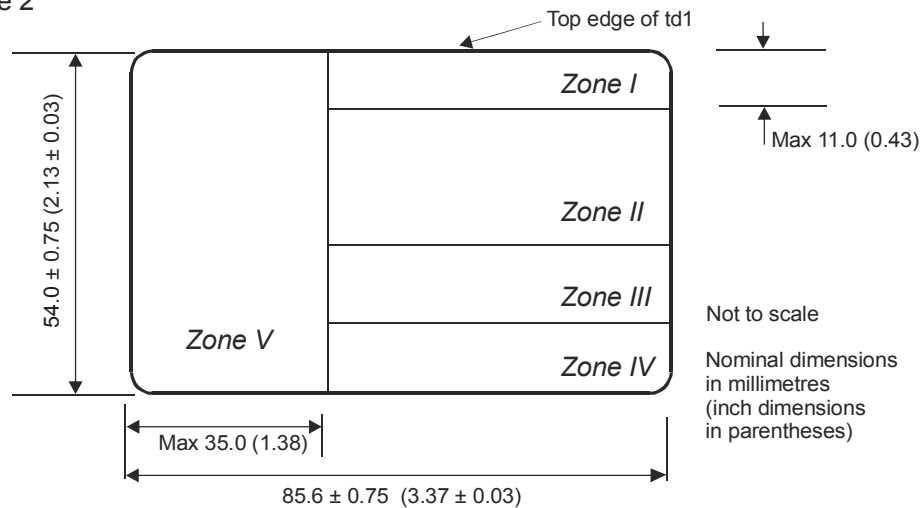
## APPENDIX 4 to Section V

NOMINAL POSITIONING OF ZONES I – V ON FRONT OF td1  
(showing alternate sizes of Zone V)

Example 1



Example 2



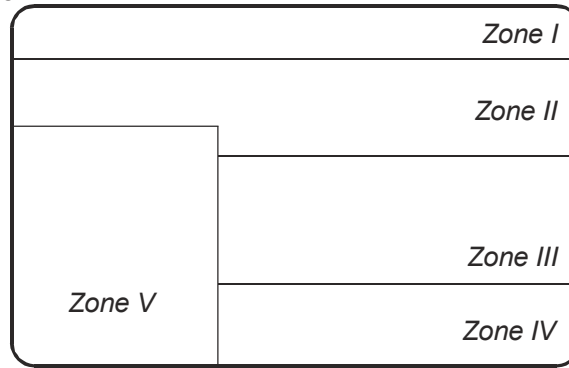
## Notes.—

1. Though the portrait is defined as a rectangular area, the actual representation of the holder may have irregular edges or have no background.
2. When the portrait is a photograph affixed to the td1 and protected by a laminate, the photograph should be positioned a further 4.0 mm (0.16 in) to the right so that it is at least 6.0 mm (0.24 in) from the edge of the document. This is illustrated by the shaded area in Example 1.
3. Example 2 indicates the maximum area available for Zone V if an issuing State wishes to have both a portrait and an adjacent second identification feature. Zone 1 is then reduced in size.

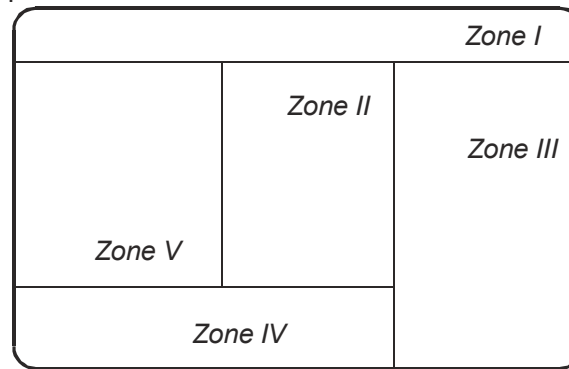
**APPENDIX 4 to Section V (cont.)**

**EXAMPLES OF ZONE FLEXIBILITY ON FRONT OF td1**

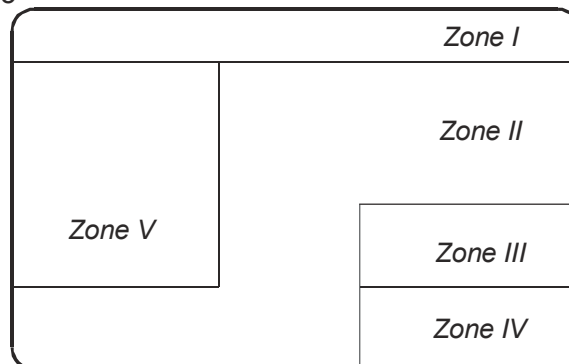
Example 3



Example 4



Example 5



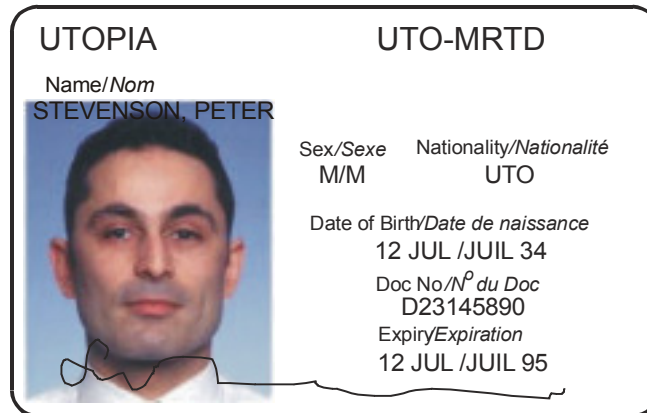
Note.— These diagrams should be considered in conjunction with Section IV, paragraph 5.



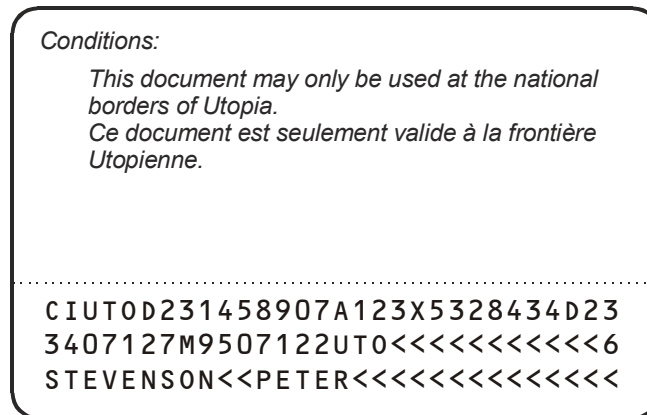


**APPENDIX 5 to Section V (cont.)**

Example 2: td1 illustrating Zones II and IV overlaying Zone V and the addition of a condition as an Optional Document Data Element in Zone VI on the rear of the td1.



Front of td1

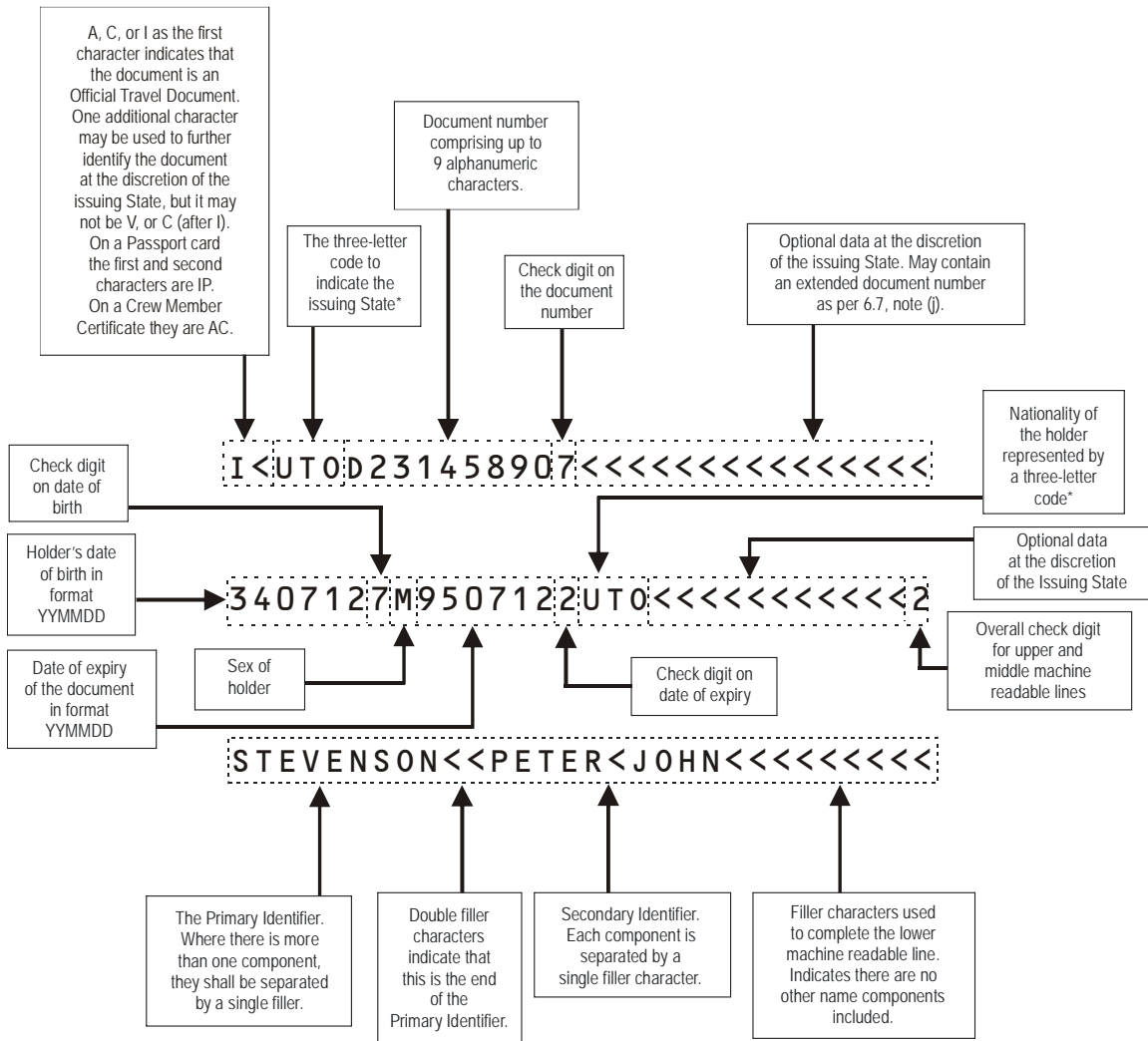


Rear of td1

Not to scale

APPENDIX 6 to Section V

CONSTRUCTION OF THE MACHINE READABLE ZONE OF td1



Notes.—

1. (\*) Three-letter codes are given in Appendix 1 of Section IV.
2. Dotted lines indicate data fields; these, together with arrows and comments boxes, are shown for the reader's understanding only and are not printed on the document.
3. Data is inserted into a field beginning at the first character position starting from the left. Any unused character positions shall be occupied by filler characters (<).

## APPENDIX 7 to Section V

### TECHNICAL SPECIFICATIONS FOR A MACHINE READABLE CREW MEMBER CERTIFICATE (CMC)

**A.7.1 Scope** — Appendix 7 defines the modifications to the td1 specifications necessary to produce a Crew Member Certificate (CMC).

**A.7.2 Content and use of zones** — The layout of the seven zones and the data elements to be included in the zones shall be as specified in Section V, with the following modifications:

**A.7.2.1** In Zone I, Field 1, the identification of the issuing authority or office may be entered below the name of the State.

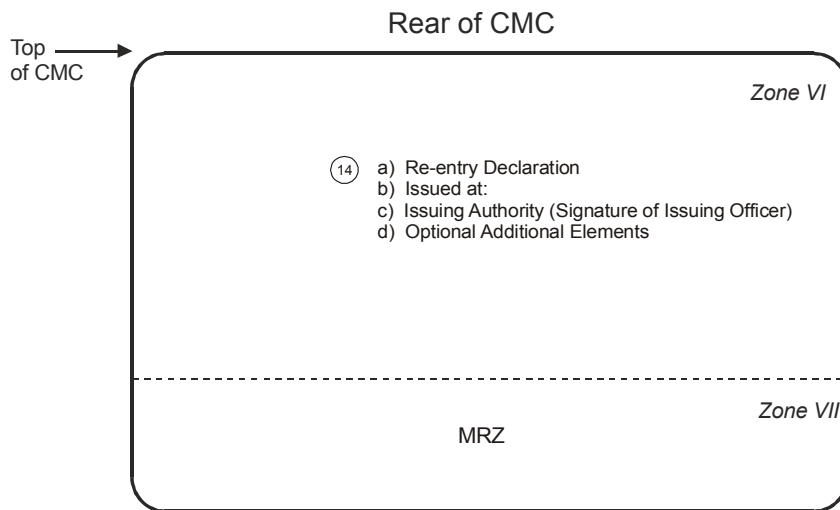
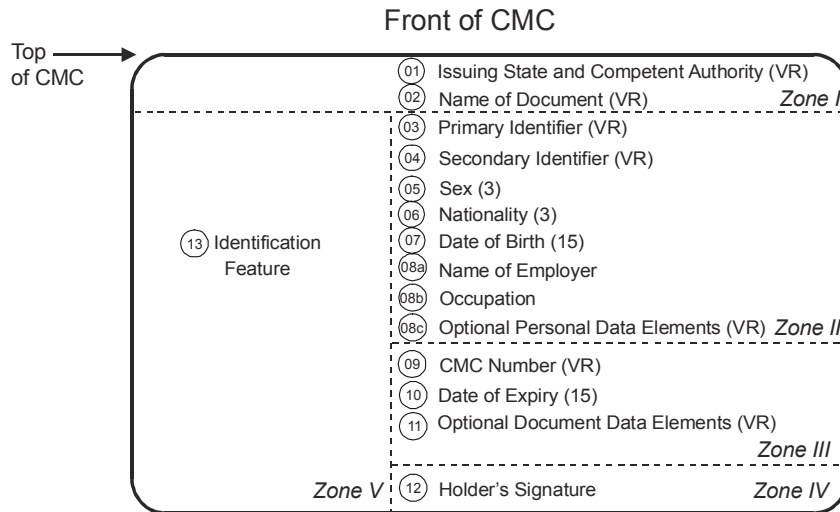
**A.7.2.2** In Zone I, Field 2, the type of document, i.e. crew member certificate, shall be entered in the national language of the State in which the document is issued, together with its translation into English, French or Spanish.

**A.7.2.3** In Zone II, in addition to the personal data specified in the td1, the name of the CMC holder's employer and the holder's employment classification, e.g. pilot or flight attendant, shall be entered.

**A.7.2.4** In Zone VI, additional details of the holder's travel status may be entered.

**A.7.2.5** In Zone VII (MRZ), the first two (2) characters in the upper machine readable line, defining the type of document, shall be AC. Characters in positions 16, 17 and 18 in the upper line shall identify the holder's employer using the two-character code specified in the IATA *Airline Coding Directory*, followed by a filler character. Alternatively, characters in positions 16, 17 and 18 shall be the three-letter code specified in Doc 8585, *Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services*.

**APPENDIX 7 to Section V (Cont)**  
**SEQUENCE OF DATA ELEMENTS FOR THE**  
**CREW MEMBER CERTIFICATES (CMC)**



Not to scale

*Notes.*

1. MRZ based on horizontal printing of 10 characters per 25.4 mm (1.0 in).
2. (VR) = variable number of characters.
3. ( ) = maximum or fixed number of characters.
4. ○ = field number.

## VI. TECHNICAL SPECIFICATIONS UNIQUE TO SIZE 2 MACHINE READABLE OFFICIAL TRAVEL DOCUMENTS

### Scope

1. This section defines those specifications which are unique to size 2 machine readable official travel documents (td2) and are necessary for global interoperability. Section VI should be read in conjunction with Section IV which defines those specifications for the td2 that are common to both sizes of MRtds.

### Dimensions of the td2

2. The dimensions shall be as follows:

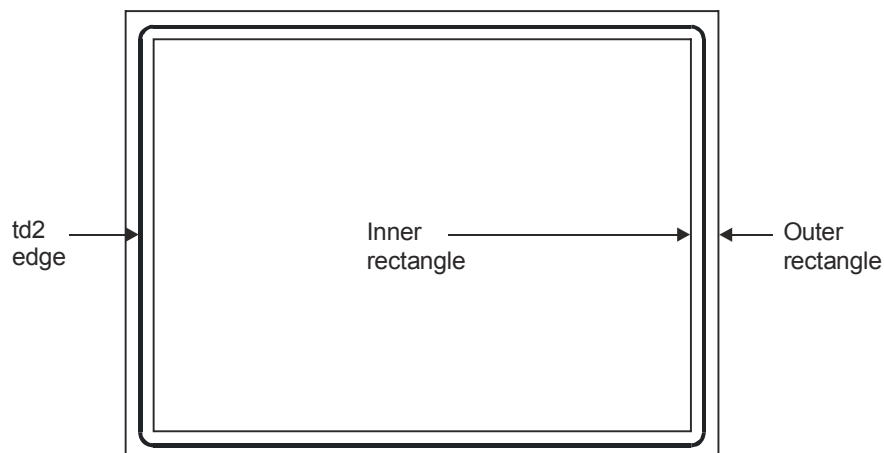
2.1 *Nominal dimensions.* The nominal dimensions shall be guided by those in ISO/IEC 7810 (except thickness) for the ID-2 type card:

74.0 mm × 105.0 mm (2.91 in × 4.13 in).

2.2 *Edge tolerances.* The edges of the document after final preparation shall be within the area circumscribed by the following concentric rectangles as illustrated in Figure VI-1.

Inner rectangle: 73.25 mm × 104.25 mm (2.88 in × 4.10 in)

Outer rectangle: 74.75 mm × 105.75 mm (2.94 in × 4.16 in).



Not to scale

Figure VI-1. td2 dimensional illustration

In no event shall the dimensions of the finished td2 document exceed the dimensions of the outer rectangle, including any final preparation (e.g. laminate edges).

*Note.— The dimensions and the tolerances specified above differ slightly from those specified in ISO/IEC 7810. This is for historical reasons; td2 cards were originally produced using encapsulated pouch card methods which are incapable of achieving the permitted tolerances of ISO/IEC 7810. Some cards may still be produced using these techniques and others where the personalization process is incapable of achieving the tight tolerances ISO/IEC 7810 requires. Wherever possible, however, dimensions and tolerances should conform to ISO/IEC 7810.*

2.3 *Margins.* The dimensional specifications refer to the outer limits of the td2. A margin of 2.0 mm (0.08 in) along each outer edge, with the exception of the header zone, must be left clear of data.

2.4 *Thickness.* The thickness, including any final preparation (e.g. laminate), shall be as follows:

2.4.1 Minimum: 0.25 mm (0.01 in).

2.4.2 Maximum: 1.25 mm (0.05 in).

2.4.3 The thickness of the area within the machine readable zone shall not vary by more than 0.1 mm (0.004 in).

*General note.— The decimal notation used in these specifications conforms to ICAO practice. The ISO practice is to use a decimal point (.) in imperial measurements and a comma (,) in metric measurements.*

### **General layout of the td2**

3. The td2 follows a standardized layout to facilitate reading of data globally by eye and machine readable means.

3.1 To accommodate the various requirements of States' laws and practices and to achieve the maximum standardization within those divergent requirements, the td2 is divided into seven zones located as follows:

#### *Front of the td2*

Zone I	Mandatory header
Zone II	Mandatory and optional personal data elements
Zone III	Mandatory and optional document data elements
Zone IV	Mandatory holder's signature or usual mark
Zone V	Mandatory identification feature
Zone VII	Mandatory machine readable zone (MRZ)

#### *Back of the td2*

Zone VI	Optional data elements
---------	------------------------

3.2 Zones I to V and Zone VII contain mandatory elements which represent the minimum requirements for the td2. The optional elements in Zones II, III and VI (when the td is a card) accommodate the diverse requirements of issuing States and organizations, allowing for presentation of additional data, while achieving

the desired level of standardization. The location of zones and data elements are set out in Appendix 1 to this section. Appendix 2 to this section illustrates the dimensional specifications for the td2. Appendix 4 to this section outlines the guidelines for positioning and adjusting the dimensional specifications of Zones I to V to accommodate the flexibility desired by issuing States and organizations. Examples of a personalized td2 are shown in Appendix 5 to this section.

### 3.3 Zone V — Position and size of the holder's portrait

3.3.1 The standard position for the holder's portrait is along the left edge of the front of the td2, as described in 5.3.4 and 5.3.5 of Section IV and illustrated in Example 2 of Appendix 4. The size of the portrait is given in the Data Element Directory (paragraph 5.1, item 13/V).

4. *Content and use of zones.* The content and use of zones and the flexibility available to adjust the relative size and location of zones is specified in Section IV, paragraph 5. Examples indicating the flexibility appear in Appendices 4 and 5 to this Section.

### 4.1 Mandatory zones

4.1.1 Zone I on the front of the td2 identifies the issuing State or organization and the document.

4.1.2 Data elements shall appear in a standard sequence in Zones II and III.

4.1.3 Zones II and III each contain a field in which optional data elements may be included. The optional field in Zone II shall be used for personal data elements and the optional field in Zone III for document-related details. Where an issuing State or organization does not use the optional fields in Zones II and III, there is no need to reserve the space for them on the td2.

4.1.4 Zone IV shall contain the holder's signature or usual mark and Zone V the personal identification feature(s) which shall include a portrait solely of the holder. At the discretion of the issuing State or organization, the name field in Zone II and the holder's signature or usual mark in Zone IV may overlay Zone V provided this does not hinder recognition of the data in any of the three zones.

4.1.5 Zone VII, located on the front of the td2, shall contain the machine readable data. Zone VII conforms in height to the MRZ defined for all MRTDs so that the machine readable data lines fall within the effective reading zone (ERZ) specified in Section IV, 16.

4.1.6 All MRZ data elements shall be shown as defined in 6.5 and 6.6.

4.2 *Optional zone.* Zone VI, on the back of the card, is an optional zone for use at the discretion of the issuing State or organization. Because the td2 is a card, Zone VI will always appear irrespective of whether or not it is used.

4.3 The flexibility available to adjust the relative size and location of zones is specified in Section IV. Examples indicating the flexibility appear in Appendices 4 and 5 to this Section.

## Detailed layout

5. *Visual inspection zone (VIZ) (Zones I to VI).* All data in the VIZ shall be clearly legible.

5.1 *Data element directory.* The data elements in the VIZ are specified as follows.



### Visual inspection zone — data element directory

<i>Field/ zone no.</i>	<i>Data element</i>	<i>Specifications</i>	<i>Maximum no. of character positions</i>	<i>References and notes*</i>
01/I	Issuing State or organization	State or organization responsible for issuing the document. This should be printed, the type font being selected at the discretion of the issuing State or organization. A translation of the name into one or more languages, one of which should be English, French or Spanish, should be given when the translated name is more familiar to the international community.	Variable	Notes a, c, e, h, i
02/I	Document	The type or designation of the document.	Variable	Notes a, b, c, e, i
03/04/II	Name	<p>The full name of the holder, as identified by the issuing State or organization. The name shall be divided, where possible, by the issuing State into two parts, the first representing that portion of the name that the issuing State or organization defines as the "primary identifier" for the holder (e.g. surname, maiden name plus married name, family name) and the second representing all remaining components (e.g. given names, initials) of the holder's name, which the issuing State or organization considers as collectively representing a "secondary identifier." The two parts, i.e. primary and secondary identifiers, once integrated, constitute the name of the document holder.</p> <p>When the issuing State or organization determines that the holder's name cannot be divided into the required two parts, as defined above, the full name of the holder shall be defined as the primary identifier.</p>	Variable	Section IV, 10; Notes a, c, i, l
03/II	Primary identifier	Predominant component(s) of the name of the holder as described above. In cases where the predominant component(s) of the name of the holder (e.g. where this consists of composite names) cannot be shown in full or in the same order, owing to space limitations of Field(s) 03 and/or 04 or national practice, the most important component(s) (as determined by the State or organization) of the primary identifier shall be inserted.	Variable	Section IV, 10; Notes a, c, i, l
04/II	Secondary identifier	Secondary component(s) of the name of the holder, as described above. The most important component(s) (as determined by the State or organization) of the secondary identifier of the holder shall be inserted in full, up to the maximum dimensions of the field frame. Other components, where necessary, may be represented by initials. Where the holder's name has only predominant component(s), this data field shall be left blank. The State or organization may optionally utilize the	Variable	Section IV, 10; Notes a, c, i, l

<i>Field/ zone no.</i>	<i>Data element</i>	<i>Specifications</i>	<i>Maximum no. of character positions</i>	<i>References and notes*</i>
		whole zone comprising Fields 03 and 04 as a single field. In such a case the primary identifier shall be placed first, followed by a comma and a space, followed by the secondary identifier.		
05/II	Sex	Sex of the holder, to be specified by use of the single initial commonly used in the language of the State or organization where the document is issued and, if translation into English, French or Spanish is necessary, followed by an oblique and the capital letter F for female, M for male, or X for unspecified.	3	Notes a, c, f, i, l
06/II	Nationality	In accordance with the codes in Section IV, Appendix 1.	3	Notes a, h, l
07/II	Date of birth	Holder's date of birth as recorded by the issuing State or organization. For unknown dates see Section IV, 14.1.7.	15	Section IV, 14; Notes a, b, c, i, l
08/II Optional element in mandatory zone	Optional personal data elements	Optional personal data elements, e.g. personal identification number or fingerprint, at the discretion of the issuing State or organization. If a fingerprint is included in this field, it should be presented as a 1:1 representation of the original. If a date is included, it shall follow the form of presentation described in Section IV, 14.1.	Variable	Notes a, b, c, d, g, i
09/III	Document number	As given by the issuing State or organization, to uniquely identify the document.	Variable	Notes a, b, c, i, j, l
10/III	Date of expiry	Date of expiry of the document.	15	Section IV, 14; Notes a, b, c, i, l
11/III Optional element in mandatory zone	Optional document data elements	Optional data elements relating to the document, e.g. date or place of issue, at the discretion of the issuing State or organization.	Variable	Notes a, b, c, d, g, i, j
12/IV	Holder's signature or usual mark	Signature or usual mark of the holder.		Section IV, 6.2; Note g
13/V	Identification feature	This field shall contain a portrait of the holder. The portrait shall not be larger than 45.0 mm x 35.0 mm (1.77 in x 1.38 in) nor smaller than 32.0 mm x 26.0 mm (1.26 in x 1.02 in). The position of the field concerned shall be aligned to the left of Zones II and III. At the option of the issuing State or organization, this field may contain another biometric identifier or security feature provided this does not obscure the portrait.  See Section IV, 6.1 for additional specifications for the portrait.  A single-digit fingerprint, if included, shall conform with the specifications defined in Section IV, 6.3.		Section IV, 6; Note e

Field/ zone no.	Data element	Specifications	Maximum no. of character positions	References and notes*
14/VI	Optional data elements	Additional optional data elements at the discretion of the issuing State or organization.		Notes a, b, c, d, g, i

## 6. Machine readable zone (MRZ) (Zone VII)

6.1 **MRZ position.** The MRZ is located on the front of the td2. Appendix 3 to this section shows the nominal dimensions and position of the data in the MRZ.

6.2 **Data elements.** The data elements corresponding to Fields 01 to 07, 09 and 10 of the visual inspection zone shall be printed in machine readable form, in the MRZ, from left to right in the sequence indicated in the data structure specifications shown below. Appendix 6 to this section indicates the structure of the MRZ.

6.3 **Print specifications.** Machine readable data shall be printed in OCR-B type font, size 1, constant stroke width, as specified in Section IV, 9.4.4. The MRZ shall be printed with the line spacing as defined in Appendix 3 to this section and a horizontal printing density of 10 characters per 25.4 mm (1.0 in).

6.4 **Print position.** The position of the left-hand edge of the first character shall be  $4.0 \pm 1.0$  mm ( $0.16 \pm 0.04$  in) from the left-hand edge of the document. Reference centre lines for the OCR lines and a nominal starting position for the first character of each line are shown in Appendix 3 to this section. The positioning of the characters is indicated by those reference lines and by the printing zones for the two code lines in Appendix 3 to this section.

### Data structure of machine readable data for the td2

#### 6.5 Data structure of the upper machine readable line

MRZ character positions (line 1)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
1 to 2	02	Document code	Two characters, the first of which shall be A, C or I, shall be used to designate the particular type of document. The second character shall be as specified in Note k.	2	Notes a, b, c, e, k
3 to 5		Issuing State or organization	The three-letter code specified in Section IV, Appendix 1 shall be used. Spaces shall be replaced by filler characters (<).	3	Notes a, c, e

<i>MRZ character positions (line 1)</i>	<i>Field no. in VIZ</i>	<i>Data element</i>	<i>Specifications</i>	<i>Number of characters</i>	<i>References and notes*</i>
6 to 36	03, 04	Name	<p>The name consists of primary and secondary identifiers which shall be separated by two filler characters (&lt;&lt;). Components within the primary or secondary identifiers shall be separated by a single filler character (&lt;).</p> <p>When the name of the document holder has only one part, it shall be placed first in the character positions for the primary identifier, filler characters (&lt;) being used to complete the remaining character positions of the MRZ.</p>	31 (Primary identifier(s), secondary identifier(s) and fillers)	Section IV, 11; Notes a, c, e
		Punctuation in the name	Representation of punctuation is not permitted in the MRZ.		Section IV, 11.9
		Apostrophes in the name	<p>Components of the primary or secondary identifiers separated by apostrophes in the VIZ shall be combined, and no filler character (&lt;) shall be inserted.</p> <p>Example:                      VIZ: D'ARTAGNAN                      MRZ: DARTAGNAN</p>		Section IV, 11.9
		Hyphens in the name	<p>Hyphens (-) in the name shall be converted to the filler character (&lt;) (i.e. hyphenated names shall be represented as separate components).</p> <p>Example:                      VIZ: MARIE-ELISE                      MRZ: MARIE&lt;ELISE</p>		Section IV, 11.9
		Commas	<p>Where a comma is used in the VIZ to separate the primary and secondary identifiers, the comma shall be omitted in the MRZ, and the primary and secondary identifiers shall be separated by two filler characters (&lt;&lt;).</p> <p>Where a comma is used in the VIZ to separate two name components, it shall be represented in the MRZ by a single filler character (&lt;).</p>		
		Name prefixes and suffixes	Prefixes and suffixes (such as Jr., Sr., II or III) shall not be included in the MRZ, except as permitted by Section IV, 11.7.		Section IV, 11.7

<i>MRZ character positions (line 1)</i>	<i>Field no. in VIZ</i>	<i>Data element</i>	<i>Specifications</i>	<i>Number of characters</i>	<i>References and notes*</i>
		Filler	When all components of the primary and secondary identifiers and required separators (filler characters) do not exceed 31 characters in total, all permitted name components shall be included in the MRZ, and all unused character positions shall be completed with filler characters (<) repeated up to position 36 as required.		Section IV, 11.3 to 11.5
		Truncation of the name	<p>When the primary and secondary identifiers and required separators (filler characters) exceed the number of character positions available for the name (i.e. 31), they shall be truncated as follows:</p> <p>Characters shall be removed from one or more components of the primary identifier until three character positions are freed and two filler characters (&lt;&lt;) and the first character of the first component of the secondary identifier can be inserted. The last character position (position 36 in the line, 31st character of the name) shall be an alphabetic character (A through Z). This indicates that truncation may have occurred.</p> <p>Further truncation of the primary identifier may be carried out to allow characters of the secondary identifier to be included, provided that the name field shall end with an alphabetic character (position 36 in the line, 31st character of the name). This indicates that truncation may have occurred.</p> <p>When the name consists of only a primary identifier which exceeds the number of character positions available for the name, i.e. 31, characters shall be removed from one or more components of the name until the last character in the name field shall be an alpha character.</p>		Section IV, 11.6; Notes a, c, d

6.6 Data structure of the lower machine readable line

MRZ character positions (line 1)	Field no. in VIZ	Data element	Specifications	Number of characters	References and notes*
1 to 9	09	Document Number	As given by the issuing State or organization, to uniquely identify the document. Spaces shall be replaced by filler characters (<).	9	Notes a, b, e, j
10		Check digit	See 8 and Section IV, 15.	1	Notes b, c, j
11 to 13	06	Nationality	The code specified in Section IV, Appendix 1 shall be used. Spaces are replaced with filler characters (<).	3	Notes a, c, e, h
14 to 19	07	Date of birth	The structure is YYMMDD, where:  YY = year (2 positions) MM = month (2 positions) DD = day (2 positions).	6	Section IV, 14; Notes b, c, e
20		Check digit	See 8 and Section IV, 15.	1	Note b
21	05	Sex	F = female; M = male; < = non-specified.	1	Notes a, c, e, f
22 to 27	10	Date of expiry	The structure is YYMMDD, where:  YY = year (2 positions) MM = month (2 positions) DD = day (2 positions).	6	Section IV, 14; Notes b, e
28		Check digit	See 8 and Section IV, 15.	1	Note b
29 to 35		Optional data elements	For use of the issuing State or organization. Unused character positions shall be completed with filler characters (<) repeated up to position 35 as required.	7	Notes a, b, c, d, e, j
36		Composite check digit	Composite check digit to verify the data elements of the lower machine readable line.  The final check digit is calculated on the basis of all figures shown on the lower machine readable line, including values for characters that are a part of the number fields and their check digits (character positions 1 to 10, 14 to 20 and 22 to 35 of the lower machine readable line).	1	See 8 and Section IV, 14; Note b

\* Notes for 5.1, 6.5 and 6.6

- a) Alphabetic characters (A–Z). National characters may be included in the VIZ (see Section IV, 8). In the MRZ only the characters defined in Appendix 3 to Section IV shall be used.

- b) Numeric characters (0–9). National numerals may be additionally included in the VIZ (see Section IV, 8). In the MRZ only the numerals 0–9 may be used as defined in Appendix 3 to Section IV.
- c) Punctuation may be included in the VIZ. In the MRZ only the filler character specified in Appendix 3 to Section IV may be used.
- d) Optional data elements may appear in Zone VI.
- e) The field caption is not printed on the document.
- f) Where a person does not wish his/her sex to be identified or where an issuing State or organization does not want to show this data, the filler character (<) shall be used in this field in the MRZ and an X in this field in the VIZ.
- g) The use of a caption to identify the field is at the option of the issuing State or organization.
- h) In the case of a document issued by the United Nations Organization, or one of its specialized agencies, to a designated official, the appropriate organization code is used in lieu of nationality. See Part B of Appendix 1 to Section IV.
- i) A blank space (or spaces) is included.
- j) The number of characters in the VIZ may be variable; however, if the document number has more than 9 characters, the 9 principal characters shall be shown in the MRZ in character positions 1 to 9. They shall be followed by a filler character instead of a check digit to indicate a truncated number. The remaining characters of the document number shall be shown at the beginning of the field reserved for optional data elements (character positions 29 to 35 of the lower machine readable line) followed by a check digit and a filler character.
- k) The first character shall be A, C or I. The second character shall be at the discretion of the issuing State or organization except that P and V shall not be used, and C shall not be used after A.
- l) The field caption shall be printed on the document.

### **Convention for writing the name of the holder**

6.7 The basic rules for writing the name of the holder appear in Section IV, paragraph 10 for the VIZ and paragraph 11 for the MRZ. Where the name contains more characters than are available in the name field of the MRZ of the td2, it is necessary to truncate the name. The following methods provide a number of options available for use at the discretion of the issuing State.

#### 6.7.1 *Truncated names — secondary identifier truncated*

- a) One or more name components truncated to initials:  
 Name: Nilavadhanananda Chayapa Dejthamrong Krasuang  
 VIZ: NILAVADHANANANDA, CHAYAPA DEJTHAMRONG KRASUANG  
 MRZ (upper line): I<UTONILAVADHANANANDA<<CHAYAPA<DEJ<K

- b) One or more name components truncated:  
 Name: Nilavadhanananda Arnpol Petch Charonguang  
 VIZ: NILAVADHANANANDA, ARNPOL PETCH CHARONGUANG  
 MRZ (upper line): I<UTONILAVADHANANANDA<<ARN<PET<CHARO

#### 6.7.2 *Truncated names — primary identifier truncated*

- a) One or more components truncated to initials:  
 Name: Dingo Potoroo Bennelong Wooloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLOO WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (upper line): I<UTOBENNELONG<W00L00M00L00<W<W<<D<P

b) One or more components truncated:

Name: Dingo Potoroo Bennelong Woolloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLoo WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (upper line): I<UT0BENNELONG<W00L00M<WAR<WARN<<D<P

c) One or more components truncated to a fixed number of characters:

Name: Dingo Potoroo Bennelong Woolloomooloo Warrandyte Warnambool  
 VIZ: BENNELONG WOOLOOMOOLoo WARRANDYTE WARNAMBOOL, DINGO POTOROO  
 MRZ (upper line): I<UT0BENNEL<W00L0<WARRA<WARNA<<DIN<P

6.7.3 *Names that just fit, indicating possible truncation by character in the last position of the name field, but which are not truncated*

Name: Jonathoon Alec Papandropoulous  
 VIZ: PAPANDROPOULOUS, JONATHOON ALEC  
 MRZ (upper line): I<UT0PAPANDROPOULOUS<<JONATHOON<ALEC

*Note.— Even though there is an alpha character in the 36th character position of this td2 lower machine readable line, this name has not been truncated, but it must be assumed that it has been truncated.*

**Representation of the issuing State or organization and nationality of the holder in the MRZ and the VIZ**

7. The use of the three-letter codes listed in Appendix 1 to Section IV is mandatory in the MRZ. In the VIZ, the name of the issuing State should appear in full; the holder's nationality in the VIZ may either appear in full or in the form of the three-letter code. Specific locations are defined in the following table.

	Zone	Field no.	Character position no.	Number of character positions
Issuing State or organization	VIZ MRZ (upper line)	01	3 – 5	Variable 3
Holder's nationality	VIZ MRZ (lower line)	06	11 – 13	3 3

**Check digits in the MRZ**

8. The method of calculating check digits is given in paragraph 15 of Section IV. For the td2, the data structure of the machine readable lines in 6.5 and 6.6 provides for the inclusion of four check digits as follows.



<i>Check digit</i>	<i>Character positions (lower MRZ line) used to calculate check digit</i>	<i>Check digit position (lower MRZ line)</i>
Document number check digit	1 – 9	10
Date of birth check digit	14 – 19	20
Date of expiry check digit	22 – 27	28
Composite check digit	1 – 10, 14 – 20, 22 – 35 (lower line) <i>Note.— Positions 11 – 13 and position 21 (lower line) are excluded in calculating the composite check digit.</i>	36

### Character sets and fonts

9. The character sets and fonts to be used in the td2 shall be as indicated hereunder.

#### 9.1 *Captions*

9.1.1 Captions shall be printed in a clear, linear type font in a size of 1.0 mm to 1.8 mm (0.04 in to 0.07 in).

9.1.2 Captions shall be in the language of the issuing State or organization. When such language uses the Latin alphabet, straight font style should be used to print the captions.

9.1.3 Where the language of the issuing State or organization is not English, French or Spanish, the printed caption as defined in 9.1.2 shall be followed by an oblique character (/) and the equivalent of the caption in English, French or Spanish. An italic font style should be used for the second language.

*Note.— Where the language of the issuing State or organization is English, French or Spanish, the issuing State or organization should use one of the other two languages to print the caption following the oblique (/) character.*

9.2 *Entered data in the VIZ.* See Section IV, 8.2

9.3 *Entered data in the MRZ.* See Section IV, 9.4.

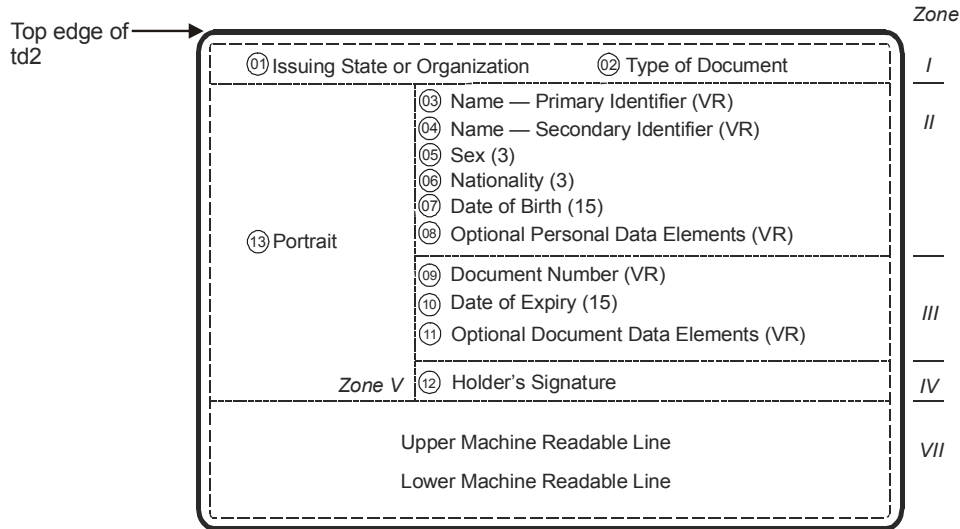
### Portrait

10. *Portrait.* A portrait, representing only the holder of the td2, shall occupy the rectangular area defined as Zone V as specified in the data element directory in 5.1 of this section and in Section IV, 6.

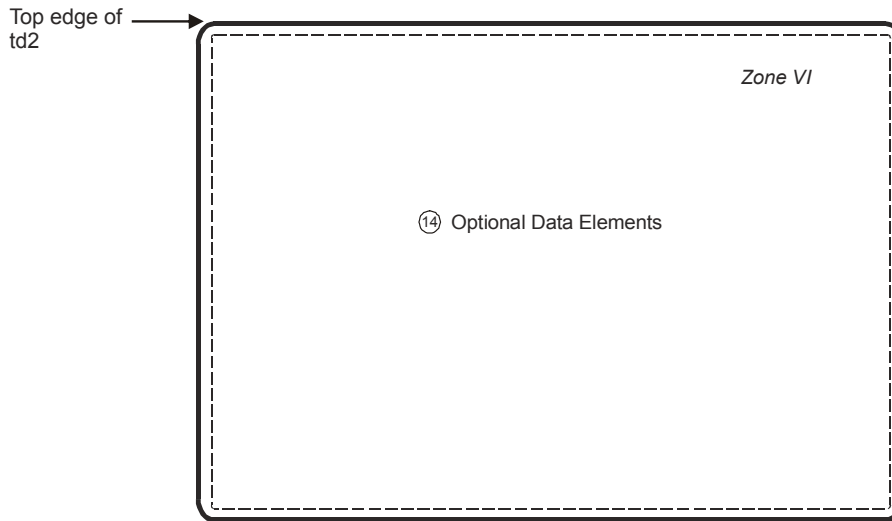
10.1 The portrait may have irregular edges. When a digitally printed reproduction is used, the background of the portrait may be dropped out in order to provide protection against forgery or substitution.

APPENDIX 1 to Section VI

SEQUENCE OF DATA ELEMENTS FOR THE  
 SIZE 2 MRTD WITH MINIMUM MANDATORY FORMAT (td2)



Front of td2



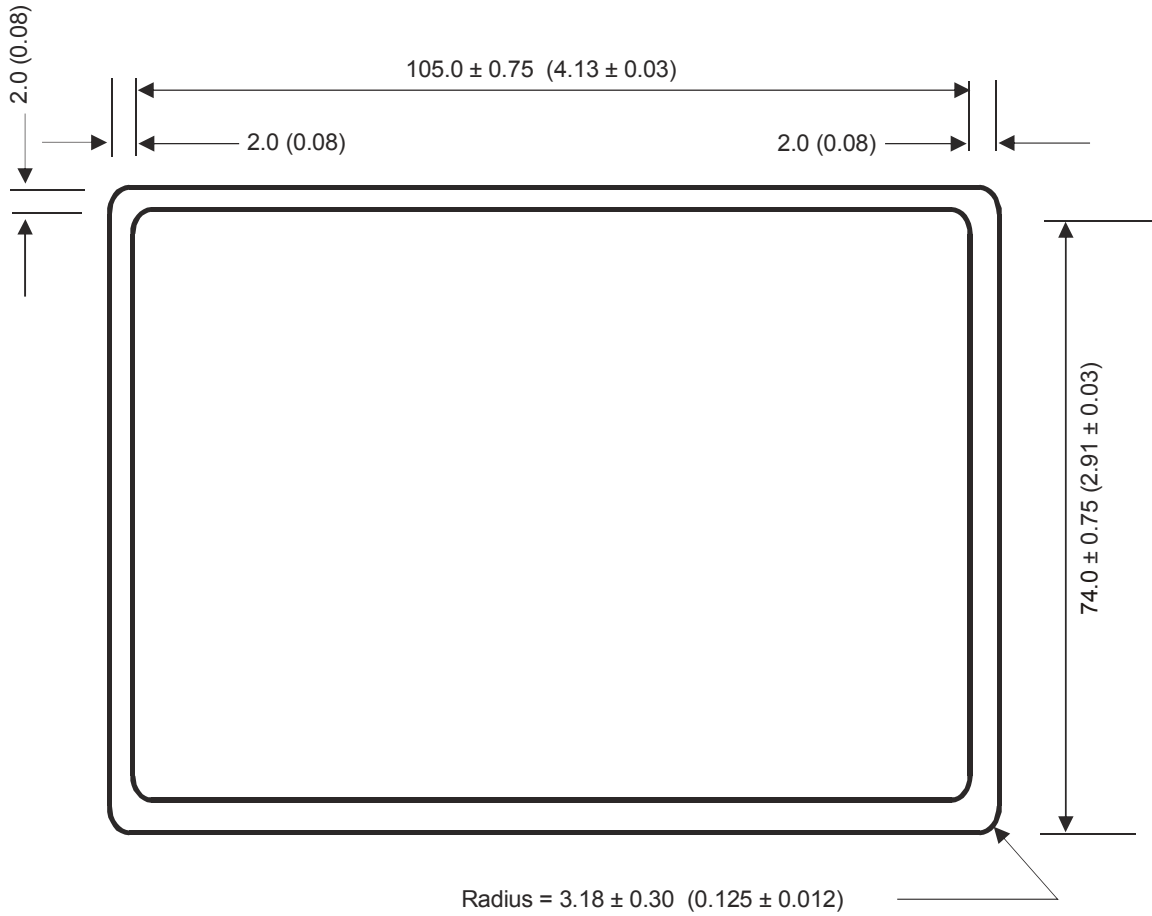
Rear of td2

Not to scale

Notes.

1. VIZ based on maximum printing density of 8 lines per 2.54 mm (0.1 in) and horizontal printing density of 15 characters per 25.4 mm (1.0 in).
2. (VR) = variable number of characters.
3. ( ) = maximum of fixed number of characters.
4. ○ = field numbers.
5. The borderlines of the zones are omitted in the actual document.

**APPENDIX 2 to Section VI**  
**SCHEMATIC DIAGRAM OF**  
**SIZE 2 MRTD WITH MINIMUM MANDATORY FORMAT (td2)**

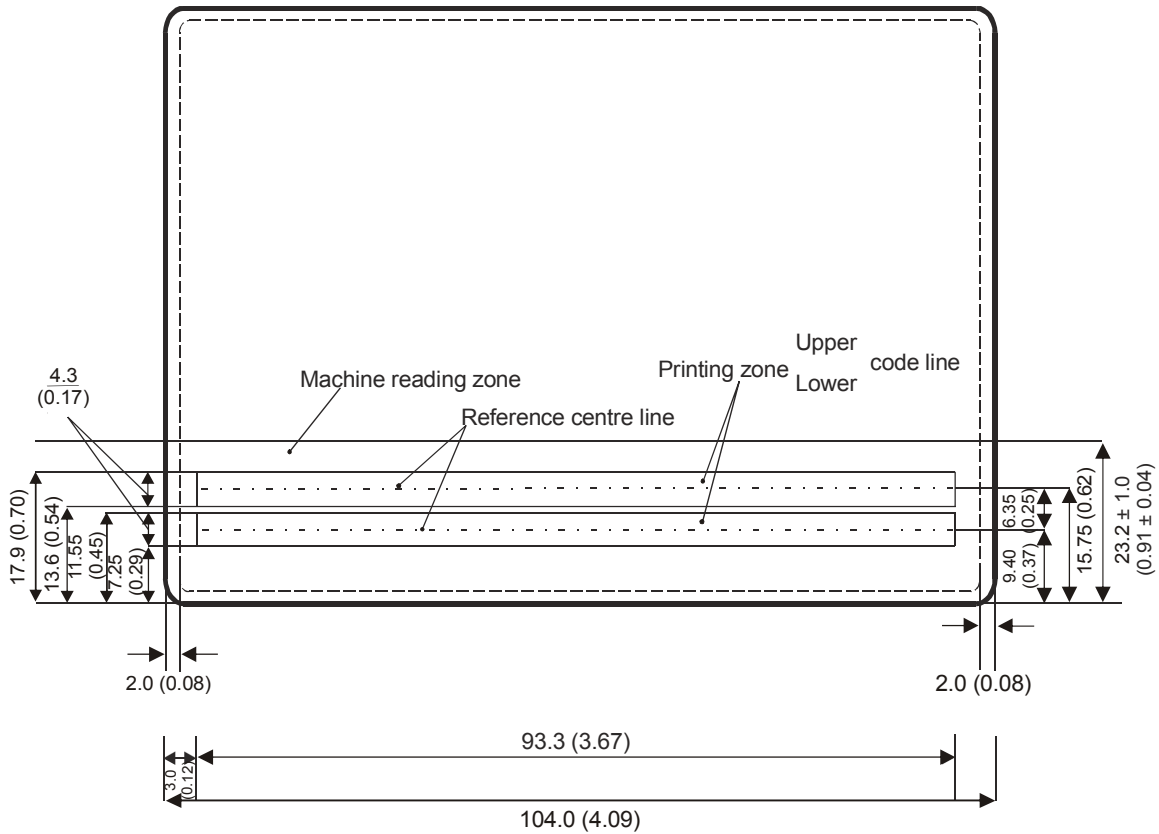


Nominal dimensions in millimetres  
(inch dimensions in parentheses)

Not to scale

APPENDIX 3 to Section VI

**SCHEMATIC DIAGRAM OF MACHINE READABLE ZONE  
 OF A SIZE 2 MRTD WITH MINIMUM MANDATORY FORMAT (td2)**



Dimensions in millimetres  
 (inch dimensions in parentheses)

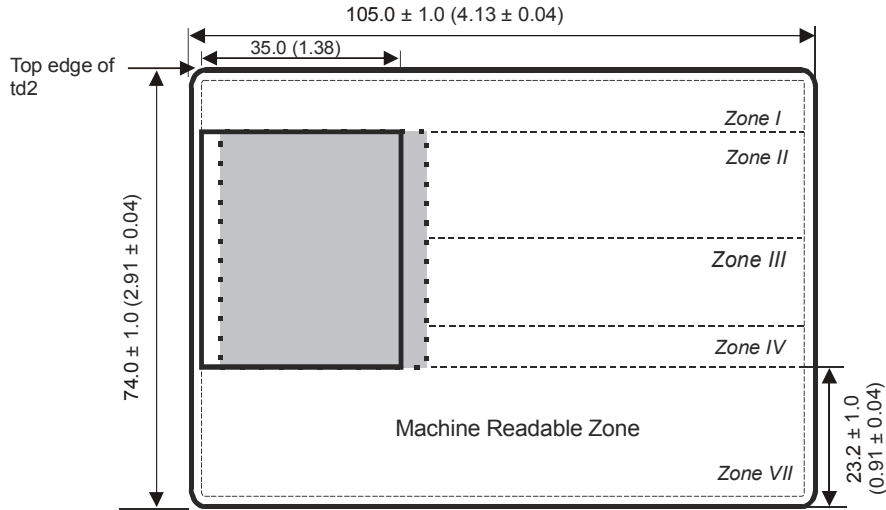
Not to scale

*Note.— For illustrative purposes, the smallest option for the 105.0 mm (4.13 in) dimension of the td2 and the smallest option for the left-hand margin in the MRZ have been selected.*

APPENDIX 4 to Section VI

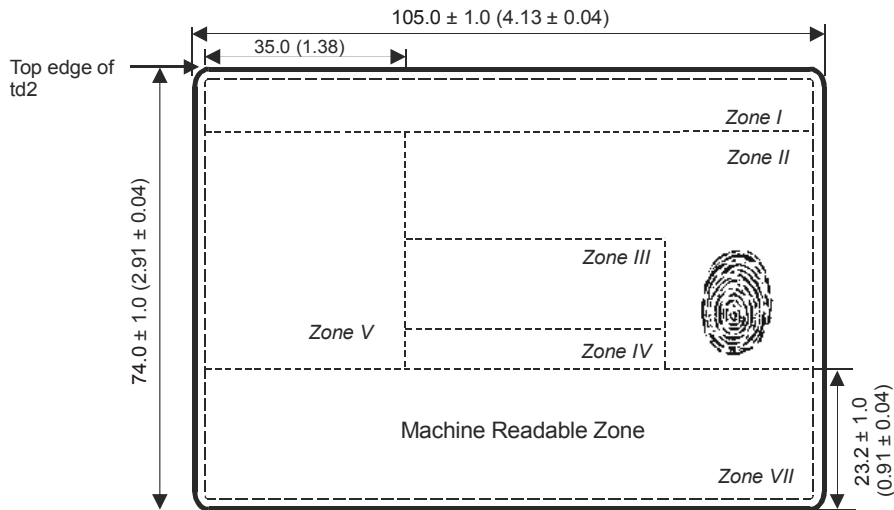
NOMINAL POSITIONING OF ZONES I — V ON THE FRONT OF td2

Example 1



Example 2

Example of zone flexibility  
(Zones III and IV reduced in size to permit optional identification feature, e.g. fingerprint in Zone II)



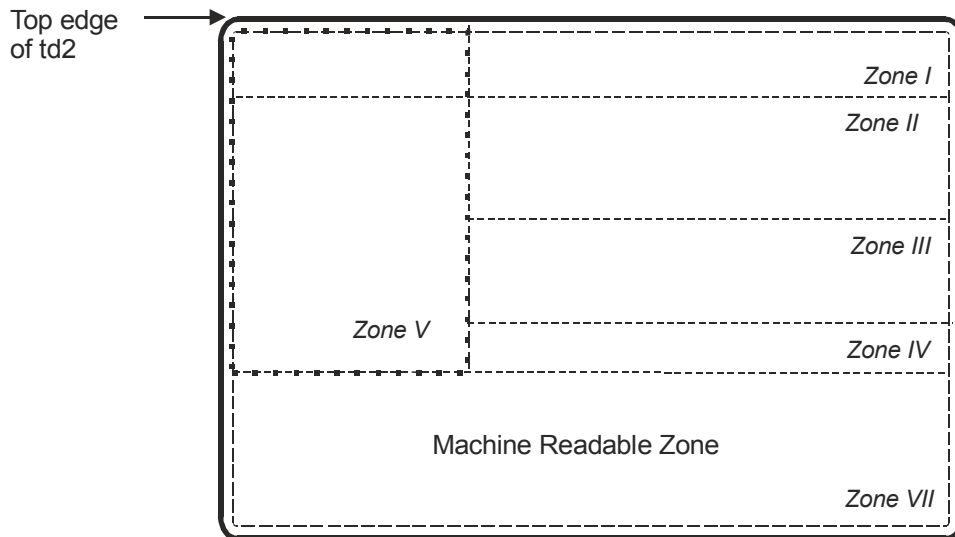
Dimensions in millimetres  
(inch dimensions in parentheses)

Not to scale

Note.— When the portrait is a photograph affixed to the td2 and protected by a laminate, the photograph should be positioned a further 4.0 mm (0.16 in) to the right so that it is at least 6.0 mm (0.24 in) from the edge of the document. This is illustrated by the shaded area in Example 1.

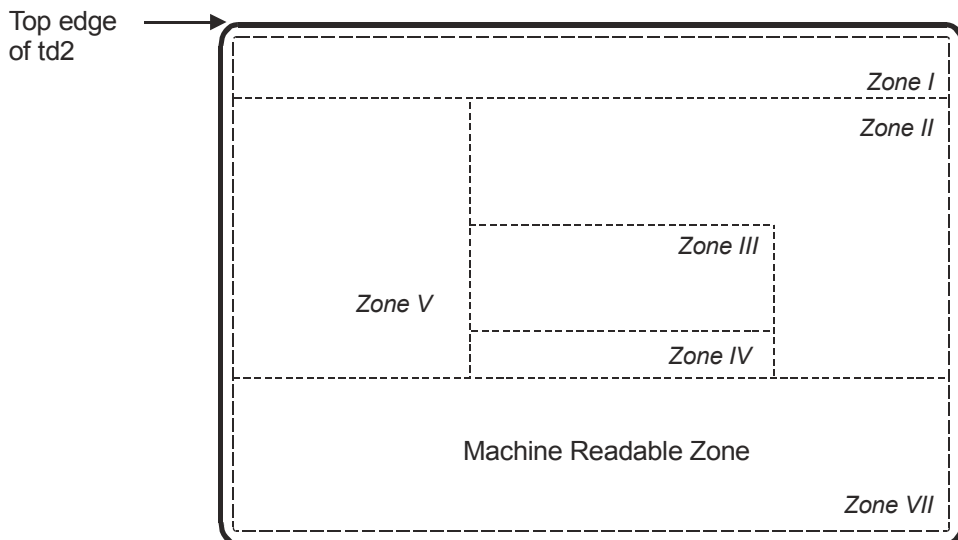
**APPENDIX 4 to Section VI (cont)**

Example 3



Example 4

'Staircase' lower boundary to Zone II



Not to scale









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