MACHINE READABLE TRAVEL DOCUMENTS TECHNICAL REPORT

Additional TD1 layout specifications for Machine Readable Official Travel Documents (MROTDs)

Version – 1.31 | September 2023

ICAO-ISO WG3 - New Technologies Working Group (NTWG), Subgroup on TD1 Layout Specifications

FOR THE INTERNATIONAL CIVIL AVIATION ORGANIZATION

Release Control

Release	Date	Description
0.25	May 2023	Initial Draft for optional TD1-Layout
0.26	May 2023	Editorial changes and complete reformatting according to TR template
0.27	May 2023	Editorial changes
0.271	June 2023	Minor editorial changes
0.28	June 2023	Review comments within editors' group
0.50	August 2023	Review comments within the NTWG
0.99	August 2023	Review comments preparation TAG-TRIP 4 meeting
1.1	August 2023	Editorial and content changes, addition of CAN placement
1.2	Sept. 2023	Editorial changes
1.3	Sept 2023	Editorial changes
1.3.1	Sept. 2023	Editorial changes (images)

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1. Scope

The motivation for this research into an amended layout for TD1 sized documents originated from the expressed interest of Member States represented in the ICAO-TAG/TRIP-NTWG in mainly two issues.

Firstly, some Member States showed interest in enlarging the size of the portrait of the document holder in order to enhance the protection of TD1-sized travel documents against forgery and photo substitution attacks on this key component of biometric identification processes at various stages during the traveller's journey.

Secondly, countries expressed interest in providing easier access to the data on the travel documents required for accessing the integrated electronic chip by utilizing 2D barcodes, therewith facilitating robust and reliable access to the traditional Machine-Readable Zone (MRZ) and/or the machine-readable Card Access Number (CAN) for both smartphone applications as well as document readers.

Hence, the aim of this research was to investigate

- whether a larger portrait of the holder could be placed on this type of MROTD and
- whether the traditional Machine-Readable Zone (MRZ) and/or the machine-readable Card Access Number (CAN) could be supplemented by another Machine-Readable element such as a 2D barcode...

… and define corresponding specifications.

1.1 Terminology

1.1.1 Technical report terminology

The key words "MUST", "MUST NOT", "SHALL", "SHALL NOT", "REQUIRED", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119].

MUST	This word, or the terms "REQUIRED" or "SHALL", means that the definition is an absolute requirement of the specification.
MUST NOT	This phrase, or the phrase "SHALL NOT", means that the definition is an absolute prohibition of the specification.
SHOULD	This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
SHOULD NOT	This phrase, or the phrase "NOT RECOMMENDED" means that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.
MAY	This word, or the adjective "OPTIONAL", means that an item is truly optional. One user may choose to include the item because a particular application requires it or because the user feels that it enhances the application while another user may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides).
CONDITIONAL	The usage of an item is dependent on the usage of other items. It is therefore further qualified under which conditions the item is REQUIRED or

RECOMMENDED. This is an additional key word used in Doc 9303 (not part of RFC 2119).

In case OPTIONAL features are implemented, they MUST be implemented as described in this Technical Report.

1.1.2 Terms and Definitions

MRZ	**Machine Readable Zone**
CAN	**Card Access Number**
MROTD	**Machine Readable Official Travel Document in the form of a card**

2. Current specification

2.1 Zone layout for the front side

Already the current specification in Doc 9303 Part 5 offers some flexibility in the zone layout for TD1-size travel documents. If issuing States or organizations want to introduce a MROTD in accordance with the present Doc 9303 Part 5 specifications, five options have been defined at this moment for the front side.

These five options (see below) for MROTD's are all landscape-orientated. These landscape-oriented documents have limitations to display the portrait of the holder considerably larger.

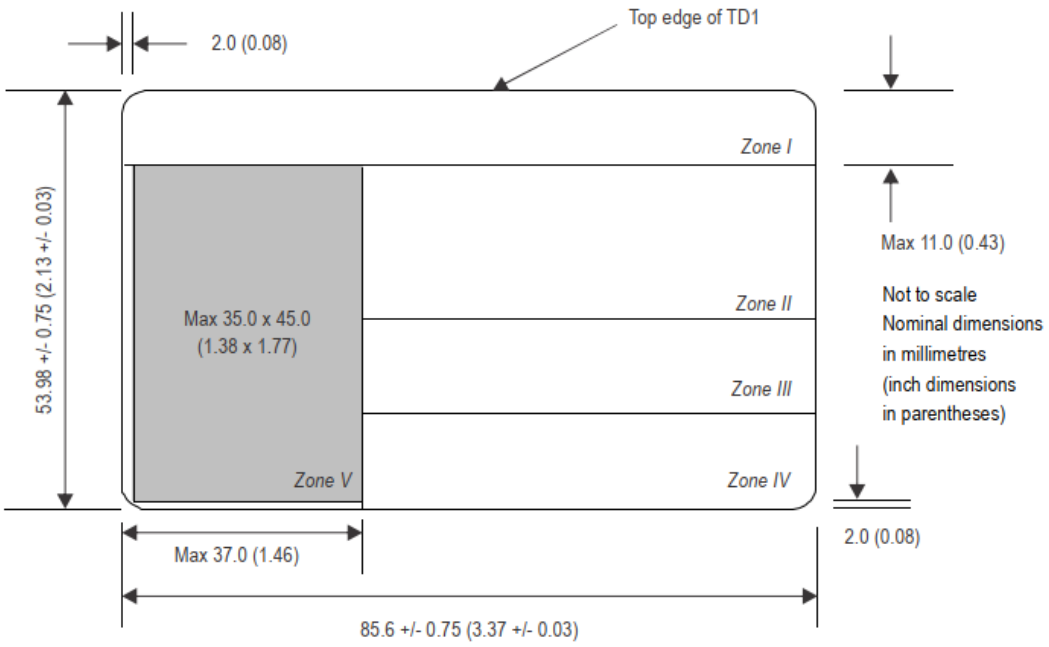

Figure 1: Doc 9303 Part 5, 8th edition, Figure 3:
Nominal layout of the zones on the front side of a TD1 Size MROTD

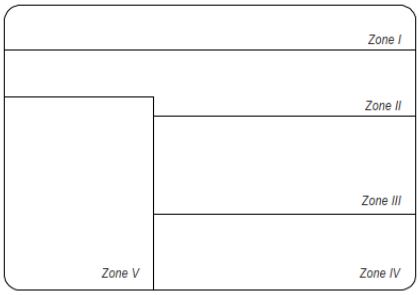

Figure 2:
Doc 9303 Part 5, 8th edition, Figure 7:
Flexible zone layout with Zone II extending above the portrait

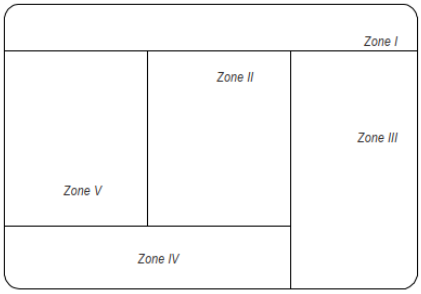

Figure 3:
Doc 9303 Part 5, 8th edition, Figure 8:
Flexible zone layout with Zone IV, Signature, beneath the portrait

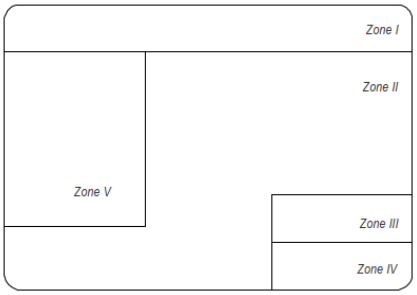

Figure 4:
Doc 9303 Part 5, 8th edition, Figure 9:
Flexible zone layout with Zone II extending beneath the portrait

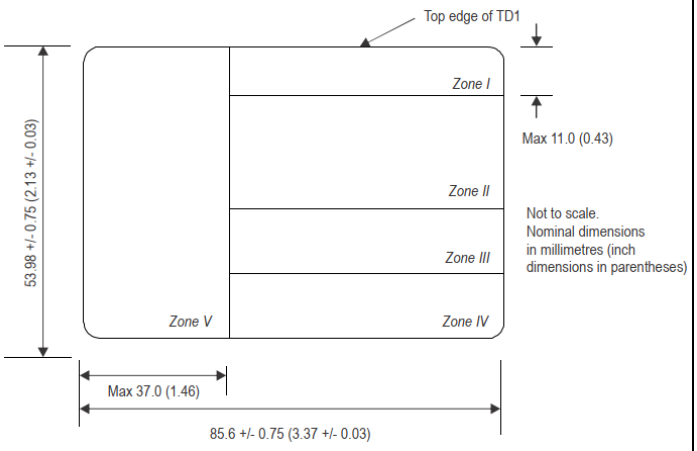

Figure 5:
Doc 9303 Part 5, 8th edition, Figure 10:
Alternate layout showing flexibility for Zone V to overlay a portion of Zone I

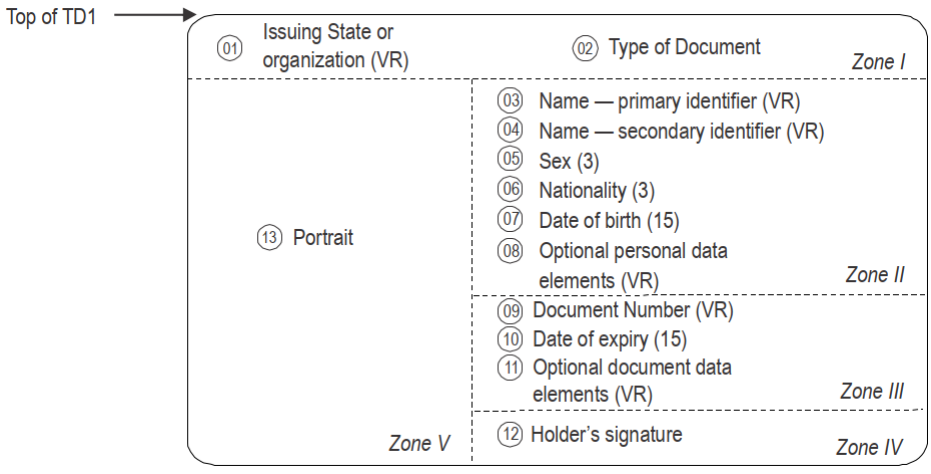

Figure 6: Doc 9303 Part 5, 8th edition, Figure 5:
Sequence of data elements on the front side of a TD1

2.2 Zone layout for the reverse side

If issuing States or organizations want to introduce a MROTD in accordance with the present Doc 9303 Part 5 specifications, the following zone layout has been defined at this moment for the reverse side.

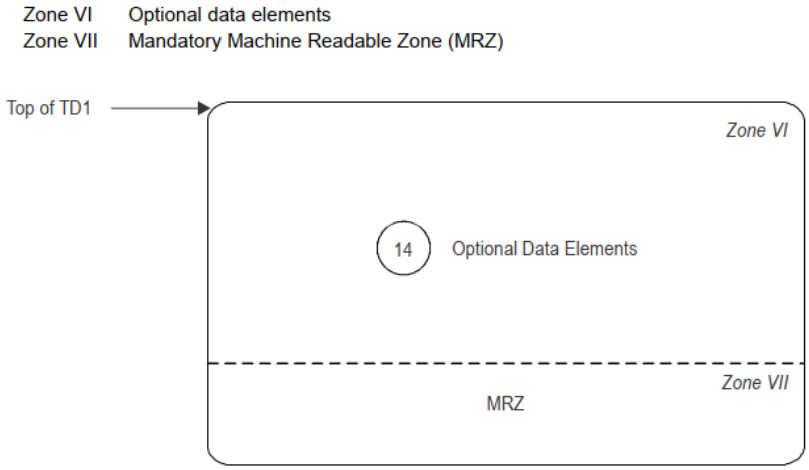

Figure 7:
Doc 9303 Part 5, 8th edition, Figure 4: Layout of zones on the reverse side of a TD1

For additional details of the zones and its contents please refer to Doc 9303-5.

2.3 Current position of the Card Access Number (CAN)

In the current Doc. 9303 8th edition, Part 5 specifications, the position of the CAN is defined as follows (section 3.2.3):

> *Vertical position is conforming to the vertical position of any one of the three MRZ lines as specified in this document and shown in Figure 6. The horizontal position shall be at the discretion of the issuing State or organization, but shall not overlap the portrait area (Zone V) or interfere with the legibility of other data in the VIZ.*

The figure that is referred to in the quote defines the dimensions of the machine-readable zone on a TD1-sized document and is reproduced in Figure 8 in this document.

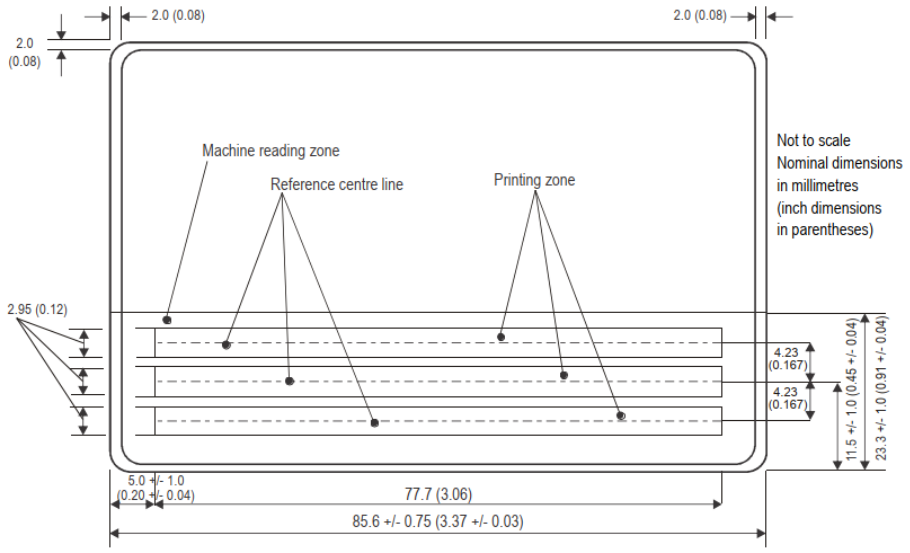

Figure 8:
Doc 9303 Part 5, 8th edition, Figure 6: Position and dimensions of Zone VII the Machine-Readable Zone

3. Additional TD1 layout specifications

3.1 General considerations

The purpose of the new zone layout options is to display the portrait of the holder considerably larger while the most relevant data remain on the front side of the card (see pictures below). In order to facilitate a significantly larger portrait, the card orientation for the new additional layout is changed from landscape to portrait. This, however, requires a substantial re-design of the zone layout since this orientation has not been addressed in ICAO Doc 9303 before. In particular, the larger space occupied by the portrait requires compromises for the remaining data to be displayed on the front side. As a result, optional data and the signature are moved to the reverse side of the card. This is shown schematically in Figure 9, while Figure 10 illustrates a possible implementation of the new TD1-sized document layout.

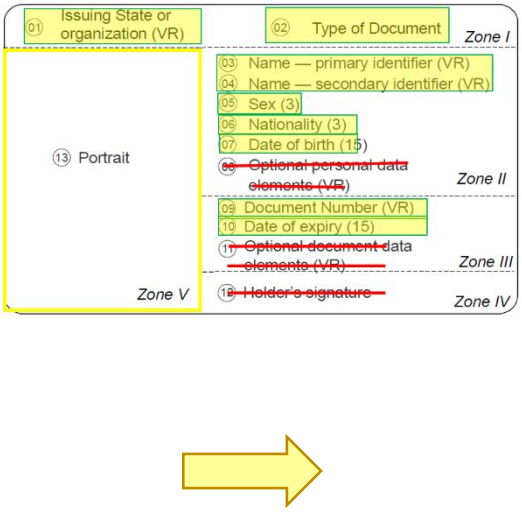

Figure 9:
Current zone layout according to Part 5:
The data elements highlighted in yellow correspond to the highlighted areas in the additional layout (Figure 10). The optional data elements and signature are moved to the reverse side.

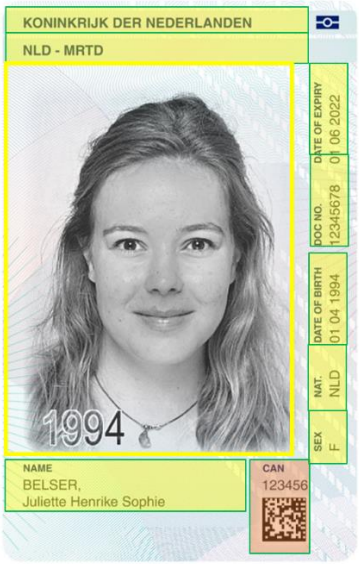

Figure 10:
Personalized example layout with portrait-oriented card:
The data elements highlighted in yellow remain on the front side.
The CAN is supplemented by a 2D barcode

3.2 Zone layout for the front side

The following two options allow for a bigger portrait of the holder of the document.

The current zone IV (signature) is moved to the reverse side of the document. Additionally, zones I, II and III are designed as flexible as denoted by the shaded areas that represent the option to extend either of the adjacent zones into these regions, i.e. allowing for this area to be used for either of the zones denoted in the shaded areas. This flexibility has been introduced after assessment of recent designs and implementations of TD1 sized documents in circulation with respect to the space utilized for zones I, II and III on these cards. In particular, countries with many official languages benefit from this flexibility as they may have specific needs for additional space in some zones.

Dimensions for Zone V (mandatory identification feature - portrait of the holder):
For this additional layout of TD1-sized documents, the mandatory identification feature (zone V) MAY now be larger than the 45.0 mm x 35.0 mm (1.26 inch x 1.02 inch) as it is currently defined in Doc 9303-5 clause 4.1.1.

Figure 11 and Figure 12 show the two proposed zone layout options for the front side of the card. In the following, specific examples of these layout options with different ways to utilize the flexibility denoted by the shaded areas are shown as different variants in subsections 3.2.1 to 3.2.6.
While variants described in subsections 3.2.1 to 3.2.4 mainly address additional space requirements in zones II and III, the variants in subsections to 3.2.6 address needs for additional space in zone I.

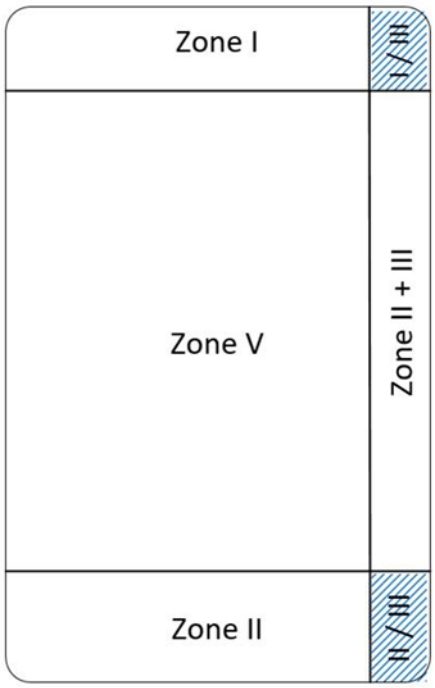

Figure 11: Option 1 for the front side

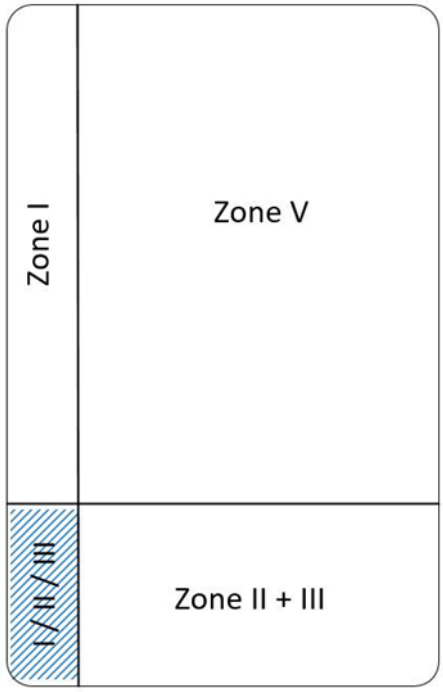

Figure 12: Option 2 for the front side

3.2.1 Front side: Option 1, Variant 1

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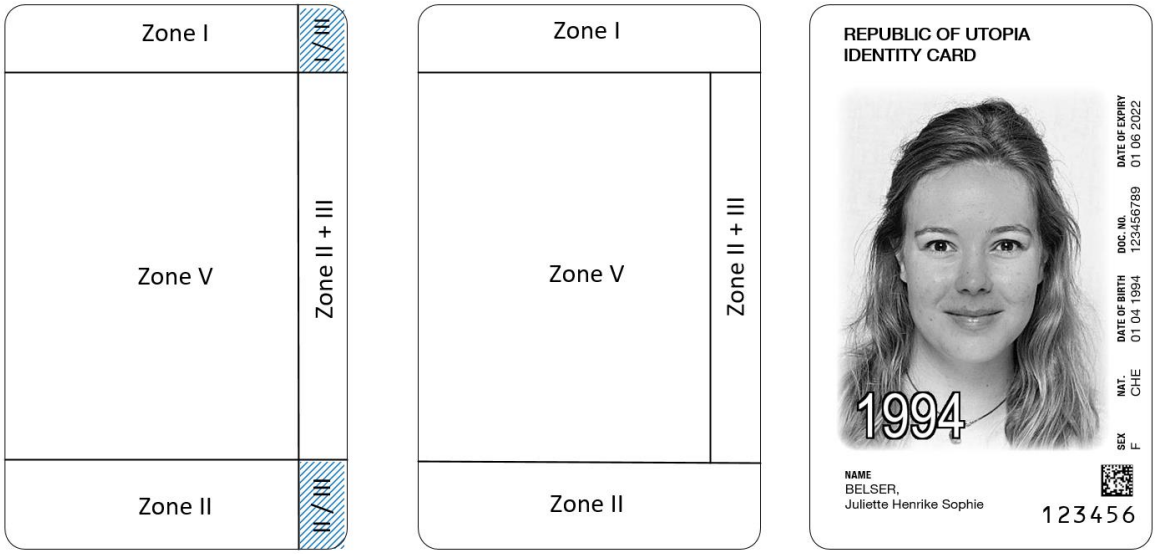

Figure 13: Front side option 1 (left), variant 1 (middle), personalized layout example (right)

Zone	Width (option 1)	Width (variant 1)	Height
Zone I	45.1 mm 1.78 inch	53.98 +/- 0.75 mm 2.13 +/- 0.03 inch	10.7 mm 0.42 inch
Zone II	45.1 mm 1.78 inch	53.98 +/- 0.75 mm 2.13 +/- 0.03 inch	13.9 mm 0.55 inch
Zone II+III	8.88 mm 0.35 inch	8.88 mm 0.35 inch	61.0 mm 2.40 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 1: Dimensions for different zones: front side option 1, variant 1

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3.2.2 Front side: Option 1, Variant 2

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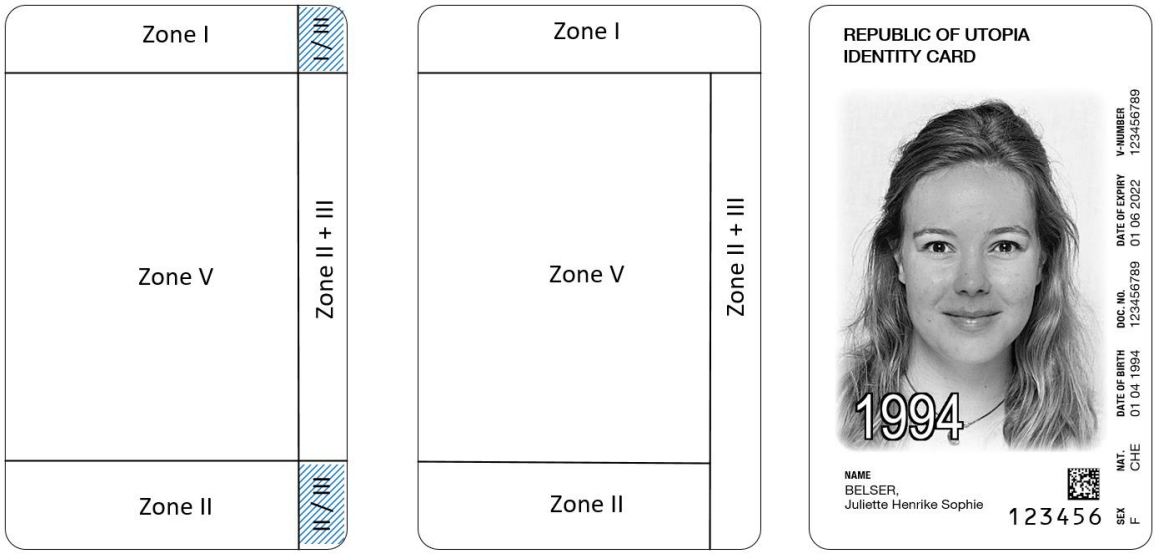

Figure 14: Front side option 1 (left), variant 2 (middle), personalized layout example (right)

Zone	Width (option 1)	Width (variant 2)	Height
Zone I	45.1 mm 1.78 inch	53.98 +/- 0.75 mm 2.13 +/- 0.03 inch	10.7 mm 0.42 inch
Zone II	45.1 mm 1.78 inch	45.1 mm 1.78 inch	13.9 mm 0.55 inch
Zone II+III	8.88 mm 0.35 inch	8.88 mm 0.35 inch	74.9 mm 2.95 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 2: Dimensions for different zones: front side option 1, variant 2

3.2.3 Front side: Option 1, Variant 3

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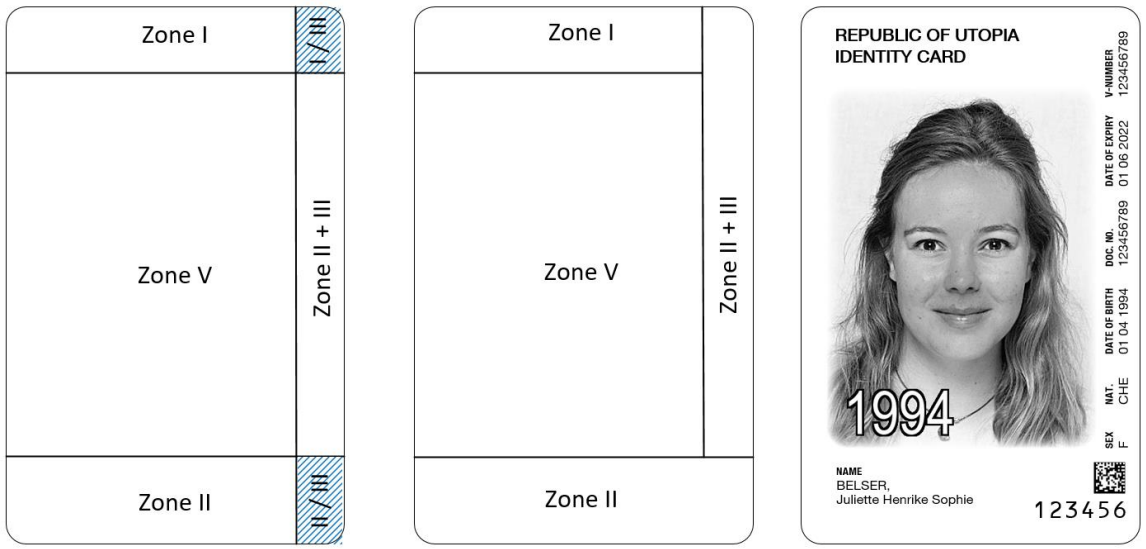

Figure 15: Front side option 1 (left), variant 3 (middle), personalized layout example (right)

Zone	Width (option 1)	Width (variant 3)	Height
Zone I	45.1 mm 1.78 inch	45.1 mm 1.78 inch	10.7 mm 0.42 inch
Zone II	45.1 mm 1.78 inch	53.98 +/- 0.75 mm 2.13 +/- 0.03 inch	13.9 mm 0.55 inch
Zone II+III	8.88 mm 0.35 inch	8.88 mm 0.35 inch	71.7 mm 2.82 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 3: Dimensions for different zones: front side option 1, variant 3

3.2.4 Front side: Option 1, Variant 4

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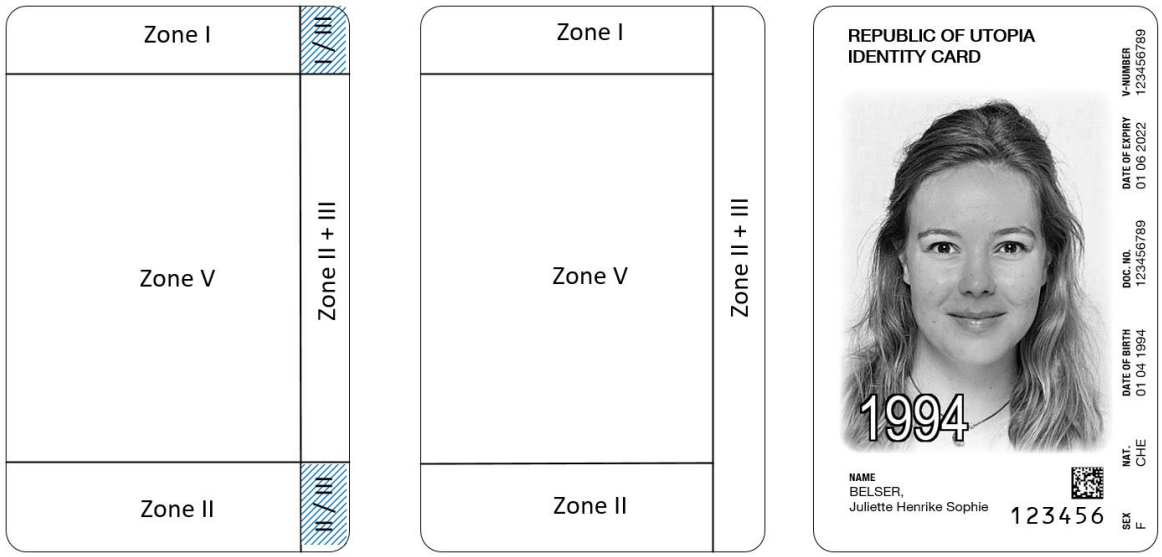

Figure 16: Front side option 1 (left), variant 4 (middle), personalized layout example (right)

Zone	Width (option 1)	Width (variant 4)	Height
Zone I	45.1 mm 1.78 inch	45.1 mm 1.78 inch	10.7 mm 0.42 inch
Zone II	45.1 mm 1.78 inch	45.1 mm 1.78 inch	13.9 mm 0.55 inch
Zone II+III	8.88 mm 0.35 inch	8.88 mm 0.35 inch	85.6 mm+/- 075 mm 3.37 inch +/- 0.03 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 4: Dimensions for different zones: front side option 1, variant 4

3.2.5 Front side: Option 2, Variant 1

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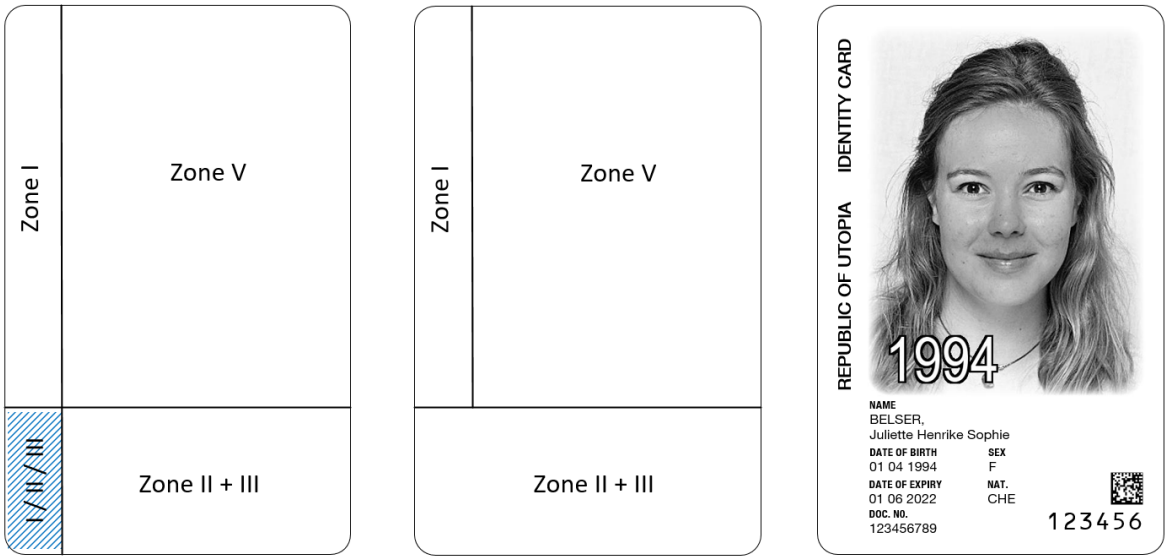

Figure 17: Front side option 2 (left), variant 1 (middle), personalized layout example (right)

Zone	Width (option 2)	Width (variant 1)	Height
Zone I	8.88 mm 0.35 inch	8.88 mm 0.35 inch	61.0 mm 2.40 inch
Zone II + III	45.1 mm 1.78 inch	53.98 +/- 0.75 mm 2.13 +/- 0.03 inch	24.6 mm 1.78 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 5: Dimensions for different zones: front side option 2, variant 1

3.2.6 Front side: Option 2, Variant 2

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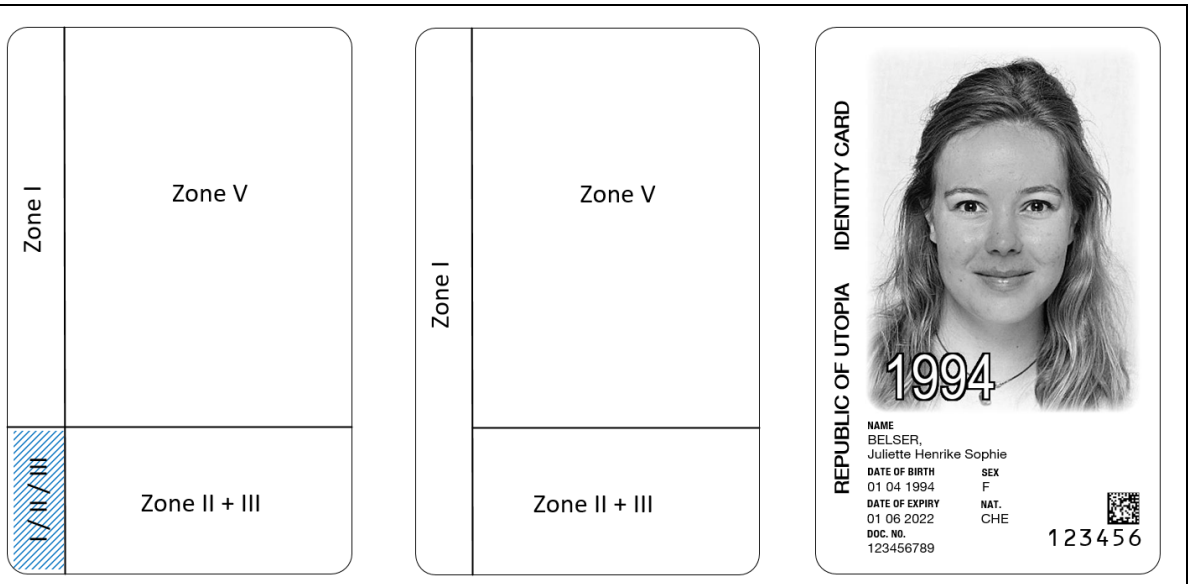

Figure 18: Front side option 2 (left), variant 2 (middle), personalized layout example (right)

Zone	Width (option 2)	Width (variant 2)	Height
Zone I	8.88 mm 0.35 inch	8.88 mm 0.35 inch	85.6 mm +/- 075 mm 3.37 inch +/- 0.03 inch
Zone II + III	45.1 mm 1.78 inch	45.1 mm 1.78 inch	24.6 mm 1.78 inch
Zone V	45.1 mm 1.78 inch	45.1 mm 1.78 inch	61.0 mm 2.40 inch

Table 6: Dimensions for different zones: front side option 2, variant 2

3.3 Zone layout for the reverse side

The following two options are defined for the reverse side of the additional layout for MROTD's.

Please note that zone IV of the current specification (signature) is moved from the front to the reverse side of the document.

Integrated circuit with contacts
When an issuing State or organization chooses, for its own or for bilateral purposes, to expand the machine-readable data capacity of a TD1 through use of an integrated circuit with contacts, the contacts SHALL be placed in Zone IV + VI."

3.3.1 Reverse side: Option 1

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This option is adapted from an already existing option in the current version of Doc. 9303 for the reverse of TD1 size documents with signature being moved from the front to the reverse.

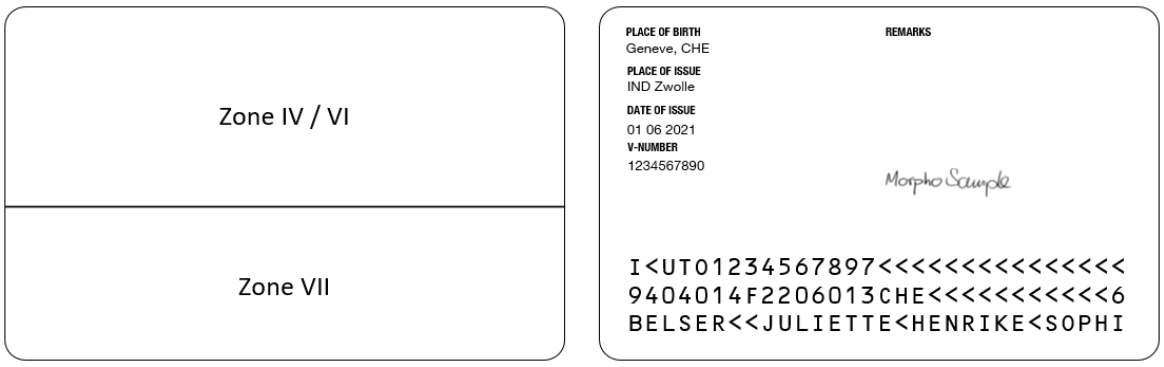

Figure 19: Reverse side option 1 (left), personalized layout example (right)

Zone dimensions: reverse side option 1 [dimensions in mm]		
Zone	**Width**	**Height**
Zone IV + VI	30.7	85.6
Zone VII	23.3	85.6

Table 7: Dimensions for different zones: reverse side option 1

3.3.2 Reverse side: Option 2

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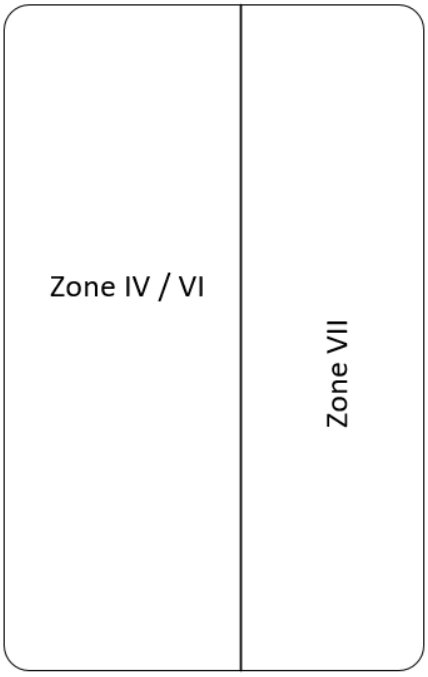
This option is intended to provide a possibility for maintaining the same portrait orientation of the TD1 document on both front and reverse side.



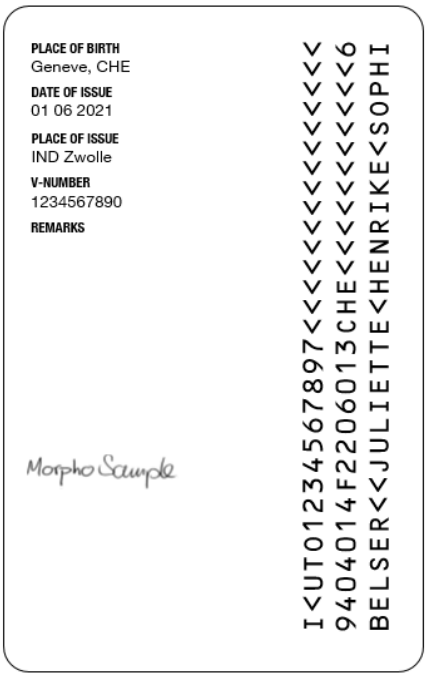


Figure 20: Reverse side option 2 (left), personalized layout example (right)

Zone dimensions: reverse side option 2 [dimensions in mm]		
Zone	**Width**	**Height**
Zone IV + VI	30.7	85.6
Zone VII	23.3	85.6

Table 8: Dimensions for different zones: reverse side option 2

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3.4 Position of the Card Access Number (CAN)

As described in section 2.3, Doc. 9303 part 5, section 3.1.1 specifies the position of the CAN for landscape-oriented TD1-size documents. In order to allow for a CAN to be oriented consistently with the fields and captions in portrait orientation as defined for this additional layout, the specifications regarding the positioning of the CAN are extended. As a result, the CAN in a portrait-oriented TD1-size document SHOULD be placed either according to the existing specification or the additional specification denoted in Figure 21 below.

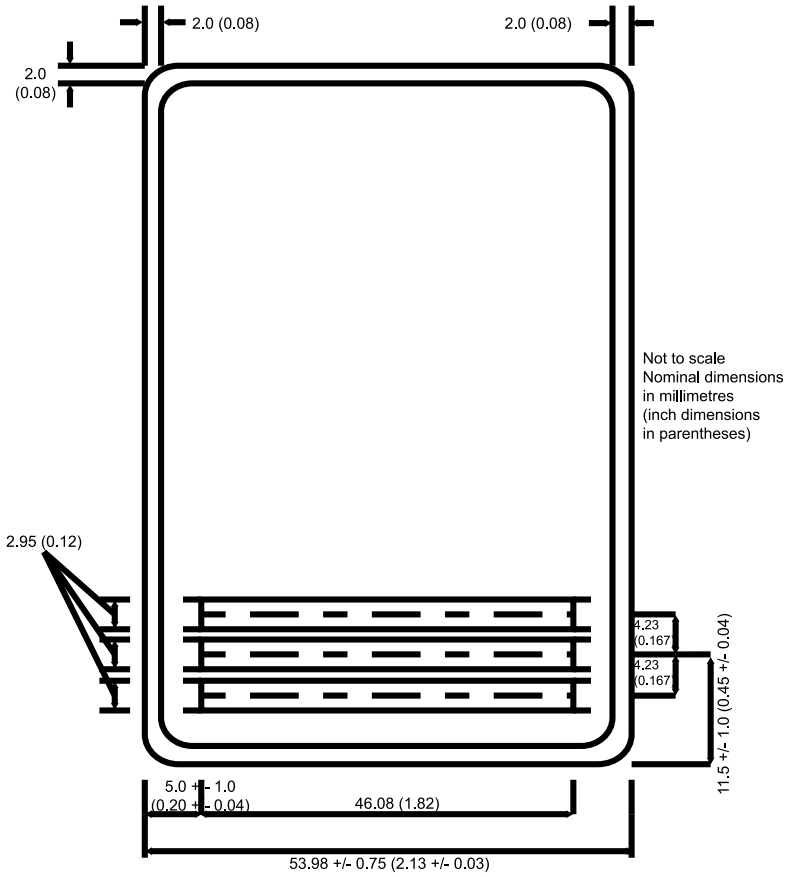

Figure 21: Additional specification for CAN placement in portrait-oriented TD1-size documents

Examples for two possible CAN orientations are given in Figure 22 below.

Figure 22: Personalized examples for a front side displaying possible placements for the CAN in portrait-orientation (left) and landscape-orientation (right).

3.5 Placement of an (optional) 2D barcode

The following figures illustrate possible placements of secure-messaging 2D barcodes for the CAN and the MRZ complying with the “ICAO Datastructure for Barcodes” (IDB) standard.

Figure 23: Personalized example for a front side displaying the CAN as 2D barcode

Figure 24: Personalized example for a reverse side displaying the MRZ as 2D barcode

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