INTERNATIONAL STANDARD

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Second edition
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Test methods for machine readable travel documents (MRTD) and associated devices —

Part 2: Test methods for the contactless interface

Méthodes d'essai pour les documents de voyage lisibles par machine (MRTD) et dispositifs associés —

Partie 2: Méthodes d'essai de l'interface sans contact

Reference number
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Contents

Page

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO/IEC 18745-2:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

— simplification of the test conditions for PCD in terms of temperature;

— modification of the loading effect required for eMRTD.

A list of all parts in the ISO/IEC 18745 series can be found on the ISO website.

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

Introduction

This document represents a necessary step in a process designed to ensure contactless communications interoperability between inspection systems and machine-readable travel documents to be accepted by them. The purpose of this document is to provide the conformance test plan that needs to be performed to ensure conformity of inspection systems and any machine-readable travel documents in accordance with ICAO Doc 9303.

This conformance test plan is not designed to repeat or duplicate the referenced specifications and associated test method [essentially ISO/IEC 14443 (all parts) and ISO/IEC 10373-6] but to list the test conditions to be performed in addition to the ones already described in the ISO/IEC 10373-6 and to define their testing and use conditions.

Test methods for machine readable travel documents (MRTD) and associated devices —

Part 2: Test methods for the contactless interface

1 Scope

This document defines the conformance test plan, based on ISO/IEC 10373-6, for the contactless interface of eMRTDs and eMRTD associated readers compliant with ICAO Doc 9303.

Application requirements for eMRTD and eMRTD reader are outside of the scope of this document and are defined in ICAO Doc 9303-10.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10373-6:2016[1)], *Identification cards — Test methods — Part 6: Proximity cards*

ISO/IEC 10373-6:2016/Amd.3:2018[1)], *Identification cards — Test methods — Part 6: Proximity cards, AMENDMENT 3: PICC loading effect*

ISO/IEC 14443-1:2018[1)], *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 1: Physical characteristics*

ISO/IEC 14443-2, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*[1)]

ISO/IEC 14443-3, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision*[1)]

ISO/IEC 14443-4:2018[1], *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol*

Doc ICAO 9303-2, *Machine Readable Travel Documents, Eighth Edition — Part 2: Specifications for the Security of the Design, Manufacture and Issuance of MRTDs*

Doc ICAO 9303-9, *Machine Readable Travel Documents, Eighth Edition — Part 9: Deployment of Biometric Identification and Electronic Storage of Data in MRTDs*

Doc ICAO 9303-10, *Machine Readable Travel Documents, Eighth Edition — Part 10: Logical Data Structure (LDS) for Storage of Biometrics and Other Data in the Contactless Integrated Circuit (IC)*

Doc ICAO 9303-11, M*achine Readable Travel Documents, Eighth Edition — Part 11: Security Mechanisms for MRTDs*

1) When ISO/IEC 10373-6 or ISO/IEC 14443 (all parts) are referred to, PICC represents the eMRTD and PCD represents eMRTD associated reader.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
test method
method for testing the characteristics of eMRTDs and eMRTD associated readers for the purpose of assessing their conformance with International Standards

3.2
sample
piece of the total number of eMRTDs or eMRTD associated readers required and presented for testing according to this document

3.3
PICC
eMRTD object

3.4
PCD
eMRTD associated reader

4 Symbols and abbreviated terms

For the purposes of this document, the following abbreviations apply.

AA	active authentication
BAC	basic access control
CVCA	country verifying certification authority
DUT	device under test
DV	document verifier
EAC	extended access control (throughout this document, the term EAC refers to EAC v1)
eMRTD	electronic machine-readable travel document
f_c	frequency of operating field as defined in ISO/IEC 14443-2
f_s	frequency of subcarrier as defined in ISO/IEC 14443-2
H_{min}	minimum field strength as defined in ISO/IEC 14443-2
H_{max}	maximum field strength as defined in ISO/IEC 14443-2
IS	inspection system
LDS	logical data structure
PACE	password authenticated connection establishment

"XY"	hexadecimal notation, equal to XY in base 16
REQA	REQuest command, Type A as defined in ISO/IEC 14443-3
REQB	REQuest command, Type B as defined in ISO/IEC 14443-3
$t_{E,PCD}$	low EMD time, PCD as defined in ISO/IEC 14443-3
$V_{E,PCD}$	EMD limit, PCD as defined in ISO/IEC 14443-2

5 Test methods for eMRTD

5.1 General test conditions

5.1.1 General

Test conditions and procedures in this clause are based on ISO/IEC 10373-6 taking into account specific needs of eMRTD application.

This clause addresses the test of the mandatory and optional features of eMRTD's contactless interface.

5.1.2 to 5.1.5 specify the different test setups, the values used for the tests, and a recommendation for the format of the test report.

Depending on the implementation statement of the applicant, Type A or Type B tests shall be performed.

All the tests defined in this document and relevant to eMRTD are applied in accordance to PICC Class 1.

For tests of ISO/IEC 14443-1 and ISO/IEC 14443-2 parameters, the minimum number of samples provided for testing is three, unless explicitly defined otherwise. The applicant may request that a larger number of samples be tested. The samples provided by the applicant shall be personalized and should be marked each with a unique serial number.

It is not mandatory to use the same samples to run all the tests defined in this document. It's recommended to provide to the test laboratory at least:

— 3 samples for static electricity test;

— 3 samples for alternating magnetic field test;

— 3 samples for ISO/IEC 14443-2 parameters;

— 1 sample for ISO/IEC 14443-3 and ISO/IEC 14443-4 parameters.

5.1.2 Test environment

Unless otherwise specified, testing shall take place at room temperature 23 °C ± 3 °C (73 °F ± 5 °F) and in an environment of relative humidity 25 % to 75 %.

5.1.3 Test conditions for PICC

Unless otherwise specified, the test conditions defined in Table 1 shall be applied.

Table 1 — Test conditions for PICC

Conditions	Temperature	Values
Field strength	At room temperature and -10 °C	1,5 A/m, 2,5 A/m, 3,5 A/m, 4,5 A/m and 7,5 A/m[a]
	At + 50 °C	1,5 A/m, 2,5 A/m, 3,5 A/m, 4,5 A/m and 6,0 A/m[b]
[a] Optional values 5,5 A/m and 6,5 A/m may be applied in addition.		
[b] Optional value 5,5 A/m may be applied in addition.		

NOTE Optional and mandatory field strength values are chosen in line with the following reasons:

— most of eMRTD associated readers operate between 1,5 A/m(rms) and 4,5 A/m(rms);

— check that there is no potential communication hole between 1,5 A/m(rms) and 4,5 A/m(rms) or more.

Unless otherwise specified, the values defined in Table 2 shall be used to adjust PICC-test-apparatus parameters.

Table 2 — Values of the PICC-test-apparatus parameters unless otherwise specified

Parameter	Value	To be applied to
Parameters applicable for all bit rates		
FSDI	8	Type A
Start Of Frame (SOF) timing	10 etu "0" followed by 2 etu "1"	Type B
End Of Frame (EOF) timing	10 etu "0"	Type B
Extra Guard Time (EGT) timing	0 etu	Type B
Maximum Frame Size Code in ATTRIB	8	Type B
Parameters applicable for PCD to PICC bit rate $f_c/128$		
PCD field envelope during 60 % of t_2	0,5 %	Type A
t_1	$40/f_c$	Type A
t_2	$7/f_c$	Type A
t_3	$12/f_c$	Type A
t_4	$6/f_c$	Type A
Overshoot	0 %	Type A and Type B
Modulation index m	12 %	Type B
Rise time, t_r, fall time, t_f	$12/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/64$ (optional)		
a	0,1	Type A
t_1	$18/f_c$	Type A
t_5	$15/f_c$	Type A
t_6	$9/f_c$	Type A
Overshoot	0	Type A and Type B
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$10/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/32$		
a	0,2	Type A
t_1	$9/f_c$	Type A
t_5	$7/f_c$	Type A
t_6	$8/f_c$	Type A
Overshoot	0	Type A and Type B

Table 2 *(continued)*

Parameter	Value	To be applied to
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$8/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/16$ (Optional)		
a	0,4	Type A
t_1	$5/f_c$	Type A
t_5	$4/f_c$	Type A
t_6	$5/f_c$	Type A
Overshoot	0	Type A and Type B
Modulation index m	12 %	Type B
Rise time t_r, fall time t_f	$6/f_c$	Type B
Parameters applicable for PCD to PICC bit rate $f_c/8$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$5/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $f_c/4$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$4/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $f_c/2$ (Optional)		
Overshoot	0	Type A and Type B
Modulation index m	8 % for short modulation pulses	Type A and Type B
Rise time t_r, fall time t_f	$2/f_c$	Type A and Type B
Parameters applicable for PCD to PICC bit rate $3f_c/4$ and $3f_c/2$ (Optional)		
PR	56°	Type A and Type B
ISI_d	0	Type A and Type B
ISI_m	1	Type A and Type B
Phase noise	0,03	Type A and Type B
Parameters applicable for PCD to PICC bit rate f_c and $2f_c$ (Optional)		
PR	60°	Type A and Type B
ISI_d	0	Type A and Type B
ISI_m	1	Type A and Type B
Phase noise	0,012 5	Type A and Type B

5.1.4 Applicant information

In order to set up the tests properly, the information specified in Table 3 shall be known by the laboratory. The information not accessible to the laboratory from the sample itself shall be provided by the applicant.