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Identification cards — Card service life —

Part 1: Application profiles and requirements

Cartes d'identification — Durée de vie des cartes —

Partie 1: Profils d'application et exigences

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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.

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

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*. 8b-8501c83e2b8b/iso-iec-24789-1

This second edition cancels and replaces the first edition (ISO/IEC 24789-1:2012), which has been technically revised.

The main changes are as follows:

- Test parameters for most methods to be included in the test plan are determined from card functional elements, the number of uses per day and the expected lifetime in years.
- Test sequences in the test plan have been shortened, a maximum of three methods occur in a sequence now.
- Test parameter calculations are only based on the number of uses per day and the expected lifetime in years; the complex calculations of environmental, storage and reader factors have been removed.

A list of all parts in the ISO/IEC 24789 series can be found on the ISO and IEC websites.

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

Introduction

This document defines a methodology for determining a test plan to simulate a card's service life.

Such a test plan consists of a set of stress exposure methods, each simulating specific types of environmental or mechanical stresses. Most of the stress exposure methods are followed by one or more evaluation methods to determine to which extent the card has survived exposure to the stress exposure method, while a few have the evaluation embedded in the stress test method.

Although the equipment and parts of the procedures of certain ISO/IEC 10373-1 test methods are referenced for employment in the simulation of aging or usage in the ISO/IEC 24789 series, such references are clearly distinguished from the normal use of ISO/IEC 10373-1. In normal use, these ISO/IEC 10373-1 test methods are applied to determine conformity to ISO/IEC 7810 and do not explicitly address application-specific requirements for card service life.

Test methodologies employed by various card industry experts are included in this document. They are based upon field experience for specific applications and card functional elements. While it is believed that the field experiences can be generally applied, there is limited field/laboratory correlation data to confirm this.

Prior to publication of this document, industry experts were given the opportunity to test cards used successfully in various applications for conformity to this document. There were no instances of participating card industry experts reporting successfully implemented functional elements failing the criteria in this document.

While this document attempts to accurately predict card service life, it is possible that some card constructions can be in conformity with this document while having field issues. It is also possible that some card constructions will not be in conformity with this document while having adequate field performance. In either of these cases, the reader of this document is advised to contact their country's national standards body (see the Foreword) and share this information so that future editions of this document can be revised accordingly.

NOTE For the convenience of certain users, non-SI equivalents are given for some quantity values where these are in common use in the ID card industry. These equivalents appear in parentheses and are for information only.

Identification cards — Card service life —

Part 1:

Application profiles and requirements

1 Scope

This document comprises a methodology for determining a test plan to simulate a card's service life. The methodology defines two parameters of card service life: the expected card service life in years and the average number of uses per day.

This document and ISO/IEC 24789-2, together along with ISO/IEC 10373-1 describe the evaluation methods to be used and their criteria.

This document was originally developed for ID-1 cards conforming to ISO/IEC 7810 but can be useful in whole or in part for other types and form factors.

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 7810, *Identification cards — Physical characteristics*

ISO/IEC 10373-1, *Cards and security devices for personal identification — Test methods — Part 1: General characteristics*

<https://www.iso.org/standard/75425.html> ISO/IEC 24789-1, *Identification cards — Card service life — Part 1: Application profiles and requirements*

<https://www.iso.org/standard/75426.html> ISO/IEC 24789-2, *Identification cards — Card service life — Part 2: Methods of evaluation*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7810, ISO/IEC 10373-1, ISO/IEC 24789-2 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

card service life

period for which a card retains the set of characteristics specified for its application under the conditions of use specified for that application from the time it is issued to the card holder

3.1.2

application profile

set of parameters that, in total, defines the conditions of use specified for an application

3.1.3

integrated circuit model width ICM width

maximum dimension of an ICM's exposed surface, measured parallel to a long edge of the card

3.1.4

integrated circuit model height ICM height

maximum dimension of an ICM's exposed surface, measured parallel to a short edge of the card

3.1.5

rounded

process of replacing a number with another number in which the last digits have been adjusted up or down

Note 1 to entry: For this document, the adjustment is to be made to get to a multiple of a convenient test variable; if the original number is exactly in the middle of the multiples, the higher of the two multiples is to be chosen.

3.1.6

rounded-up

process of replacing a number with another number in which the replacement number is chosen to be either an exact multiple of a convenient test variable or the next higher multiple of the test variable

3.1.7

visual personalization

information on a card that is visible by eye with ambient and specialized lighting, including protective and security coatings applied on top of the personalized card

3.1.8

card, independent of personalization

card, with or without personalization

3.1.9

patch

cut film, smaller than the ID-1 card face that is applied over parts of the card surface

3.2 Abbreviated terms

ICM integrated circuit(s) module

PICC proximity integrated circuit card

RH relative humidity

VICC vicinity integrated circuit card

4 Determination of the card application profile

4.1 General

During its service life a card is exposed to a broad range of influences that can degrade and weaken the card until it is finally no longer fit for purpose.

Examples for such influences are:

- heat and humidity, for example causing breakdown of material within the card;
- temperature changes, for example causing separation of previously well adhering components inside the card;

- bending, for example causing breakdown of the card material, or causing mechanical failure of an electrical connection inside the card;
- friction, for example causing text written on the card's surface to become illegible.

Various test methods have been developed to simulate the impact of certain influences onto the card, such as:

- temperature and humidity storage test, to simulate the impact of heat and humidity;
- temperature cycling to simulate the impact of temperature changes;
- dynamic bending stress test, to simulate the impact of a certain type of bending applied to the card;
- surface wear tests, to simulate the effects of friction on the card's surface;

Additional informative methods have been documented in the informative [Annex A](#), but are not required to be included in the test plan.

This document provides a systematic approach to determine a test plan containing a range of test methods and the related test parameters.

The following necessary indicators shall be determined:

- the functional elements the card contains;
- the application profile variables (according to [4.2](#)).

By applying the rules defined in this document, a test plan based on the above indicators is determined.

4.2 Determining application profile variable values

The usage frequency and the card lifetime in the field have a strong impact on the cumulative stresses the card will have to withstand. These parameters dictate testing and requirements for determining conformity to this document. The values for the two variables shall be determined as follows:

- A, the expected card service life in years (whole number, at least 1);
- U, the average number of uses per day (greater than 0).

To reduce the number of combinations of U values resulting in slightly different test plans, the use of one of the values in [Table 1](#) for U is recommended.

Table 1 — Recommended values for U

Recommended values for U (uses per day)							
0,05	0,1	0,2	0,5	1	2	5	10

4.3 Converting classes as defined in 24789-1:2012 (the previous edition of this document) into application profile coefficients as defined in this document

[Table 2](#) gives approximate values for the age coefficient A and the usage coefficient U as they are used in this version of ISO/IEC 24789-1, relative to aging class and usage class values as they were used in 24789-1:2012.

[Table 2](#) is not an exact mathematical correlation, but an estimated equivalence. The user of this document should not assume that A and U derived from [Table 2](#) are automatically representative for their application.

Table 2 — Approximate correlation of ISO/IEC 24789-1:2012 (the previous edition of this document) classes to this document

Aging		Usage	
ISO/IEC 24789-1:2012 (the previous edition of this document)	This document	ISO/IEC 24789-1:2012 (the previous edition of this document)	This document
Aging class	A, the expected card service life in years (at least 1)	Usage class	U, the average number of uses per day (greater than 0)
0	1	A	0,1
1	4	B	0,5
2	7	C	2
3	10	D	10

5 Inputs to card life requirements

5.1 General

Card industry experts believe that card service life testing and requirements must be based upon three key factors: functional elements on cards, expected card life and card use frequency.

5.2 Card functional elements

Card functional elements dictate what test methods need to be performed on cards. The testing can be individual test methods, or a series of tests performed sequentially.

5.3 Expected card life

The time a card is expected to be functional after issuance is an obvious factor in determining card service life. In the case of this document, the expected card life will be used to determine how many times a test sequence is performed before running conformity testing. It can also be used to determine either performance metrics or exposure severity of individual test methods, or both.

5.4 Card use frequency

Card use frequency is used to determine test method variables, such as accelerated aging test exposure times, number of dynamic bendings and other test parameters.

6 Card tests

6.1 General

Cards shall be evaluated for conformity by running test methods that are required for the chosen card functional elements as per [Clause 8](#) Card testing and requirements. The test methods can be stand-alone, single iteration sequential or multiple iteration sequential test methods.

6.2 Stand-alone test methods

Stand-alone test methods shall be run on cards using tests from ISO/IEC 10373-1 and ISO/IEC 24789-2. Variable test parameters shall be used when determined by this document. These parameters are based upon the expected card life and card use frequency.

6.3 Single iteration sequential test methods

Single iteration sequential test methods shall be run using a series of tests from either ISO/IEC 10373-1 or ISO/IEC 24789-2, or both. Variable test parameters can be included in the test conditions and will be a function of either expected card life or card use frequency, or both. The test sequence shall be run once.

The sequential test method tables are structured such that the testing is done sequentially from top to bottom of the tables using the parameters listed.

6.4 Multiple iteration sequential test methods

Multiple iteration sequential test methods shall be run using a series of tests from either ISO/IEC 10373-1 or ISO/IEC 24789-2, or both. Variable test parameters can be included in the test conditions and will be a function of either expected card life or card use frequency, or both.

The number test sequence iterations (i) that shall be run will be based upon expected card life, A (years). In the case where the test sequences are repeated the following applies:

Number of Iterations, $i = 1 + A/3$, rounded to the nearest whole number. The number of test iterations shall be 1 minimum and 4 maximum.

Table 3 — Number of test sequence iterations vs expected card life

Expected card life (years)	Number of test sequence iterations, i
1	1
2 to 4	2
5 to 7	3
8 and greater	4

The sequential test method tables are structured such that the testing is done sequentially from top to bottom of the tables using the parameters listed. If the number of test sequence iterations is greater than 1, then the sequential tests are performed again until the number of sequence iterations is equal to the calculated value.

7 Card functional elements supported by this document

7.1 Visual personalization

7.1.1 General

Information applied to cards using various technologies shall be durable enough so that all the information is functional for the intended card use during its life.

7.1.2 Surface printing

Cardholder data can be applied by surface printing. Surface printing also includes layers added after personalization to improve either durability or security, or both.

Surface printing includes, but is not limited to, dye diffusion thermal transfer, resin thermal transfer and ink jet. The printing can be applied directly to either the card surface or by transferring a printed media to the card surface, or both.

Protective and security layers on top of the personalization include, but are not limited to, heat transfer films, ink jet coatings or patch laminates. These elements can include security features designed to dissuade efforts to either modify card information or to counterfeit the cards, or both.