INTERNATIONAL STANDARD

ISO/IEC 24789-1

First edition
2012-04-15

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

Reference number
ISO/IEC 24789-1:2012(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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.

ISO/IEC 24789-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

ISO/IEC 24789 consists of the following parts, under the general title *Identification cards — Card service life*:

— *Part 1: Application profiles and requirements*

— *Part 2: Methods of evaluation*

Introduction

This part of ISO/IEC 24789 comprises a methodology for determining application profiles, their requirements and corresponding examples.

These application profiles and requirements are intended to guide the reader of this part of ISO/IEC 24789 on the comparative rigour of various ID card service life applications. These profiles and requirements provide a means for ranking and comparing the main factors affecting ID card service life in a manner that is suitable for evaluation using the methods defined or referenced in ISO/IEC 24789-2.

In order to accommodate existing cards, the simplest class uses, at least, characteristics and criteria defined in ISO/IEC 7810 and test method equipment and procedures defined in ISO/IEC 10373-1. Two types of cards are taken into account, cards that contain an integrated circuit and cards that do not contain an integrated circuit.

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 ISO/IEC 24789, 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.

Due to a lack of field/laboratory correlation data, only limited acceptance criteria (normative application profiles and requirements) can be provided in the 2010 edition of this part of ISO/IEC 24789. However, it is anticipated that a more comprehensive set of values for acceptance levels will be available in future editions.

At the time of publishing this first edition, there is limited data to show direct equivalence to any measure of actual field use conditions. It will not be possible to establish any such equivalence until and unless a degree of quantitative correlation has been established for the ID card construction in question.

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 parenthesis and are for information only.

Identification cards — Card service life —

Part 1:
Application profiles and requirements

1 Scope

This part of ISO/IEC 24789 comprises a methodology for determining application profiles, their requirements and corresponding examples. It contains no additional or changed requirements for the ID card properties defined in other applicable standards. It seeks to define the relative rigour of each application defined herein in terms of a set of simple but justifiable methods of evaluation.

The purpose of ISO/IEC 24789 is to provide guidance on methods and their use to simulate a card's service life. In order to achieve this purpose, two parameters of card service life are defined: age and usage. This can be represented as a two-dimensional matrix in which each age/usage combination corresponds to a card service life class. The two parts of ISO/IEC 24789 together describe the evaluation methods to be used and their criteria.

ISO/IEC 24789 was originally developed for ID-1 cards conforming to ISO/IEC 7810, but might be found useful in whole or in part for other types and form factors.

References are given to the corresponding methods of evaluation in ISO/IEC 24789-2 and elsewhere.

2 Normative references

The following referenced documents are indispensable for the application 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, *Identification cards — Test methods — Part 1: General characteristics*

ISO/IEC 10373-2, *Identification cards — Test methods — Part 2: Cards with magnetic stripes*

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, definitions and abbreviated terms given in ISO/IEC 7810, ISO/IEC 10373-1, ISO/IEC 10373-2, ISO/IEC 24789-2 and the following apply.

3.1.1
card service life
CSL
period of time and usage 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, define the conditions of use specified for an application

3.1.3
evaluation regime
set of evaluation methods, together with their manner of combination and application

3.2 Abbreviated terms

ATM Automated Teller Machine

IC Integrated Circuit

PICC Proximity Integrated Circuit Card

VICC Vicinity Integrated Circuit Card

4 Card applications and their profiles

4.1 Determination of the application profile

4.1.1 Raw application profile

Three variables are used to establish the raw application profile. These are:

— environment;

— storage;

— reader profile.

Raw application profiles have two parameters:

— age (*A*);

— usage (*U*).

NOTE Age is the time dependent parameter and usage is the stress dependent parameter (see 4.2).

To determine the application profile, define the environmental, storage and reader factors in Table 1, Table 2 and Table 3 respectively by defining the probability for each condition in the column “Probability *p*”. The sum of probabilities for each factor shall be 1.

Next, for each condition with a probability greater than 0, calculate the age points in column “Age points” by multiplying the value in the column “Age” with the probability *p* in the column “Probability *p*”. Then calculate the usage points in columns “Usage points” by multiplying the value in the column “Usage” with the probability *p* in the column “Probability *p*”.

Then, calculate the sum *A* of all age points and the sum *U* of all usage points. This pair of values (*A*, *U*) is the raw application profile for the application.

Table 1 — Environmental factors

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0				
	Low (below 5°C)	1	0				
	High (30°C to 50°C)	2	0				
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0				
	> 1 per week and <=1 per day	2	0,6				
	> 1 per day and <=3 per day	3	0,9				
	>3 per day	5	1,5				
Relative humidity	Normal (30% - 70%)	0	0				
	Dry (< 30%)	1	0				
	Humid (> 70%)	3	0				
Daylight	None	0	0				Normally carried in a wallet or a bag.
	Indoor	1	0				Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0				Residential, office or retail environment.
	Medium	2	0				Light factory environment; outdoor ID badge usage.
	High	5	0				Car repair or heavy factory environment.
Sum (*A*, *U*)							

Table 2 — Storage factors

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2				Multiple cards stacked in soft plastic holder or wallet in trouser pocket.
	High	0	5				Multiple cards shingled in wallet in trouser pocket; single card loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0				Card always remains in holder, e.g. PICC.
	Low	1	0				Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0				Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder.
	High	5	0				Inserted in reader in vehicle; loose in pocket or bag.
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2				Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5				Loose in bag or pocket.
Sum (*A*, *U*)							

Table 3 — Reader factors

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller))	None	0	0				PICC or VICC reader.
	Low	0	1				Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2				Contact IC card reader with bent insertion path[a)].
	High	0	3				Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0				PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1				Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader, where construction or installation results in bending of the card.

Table 3 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0				Insertion readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1				Magnetic stripe swipe reader.
	Medium	0	2				PICC reader in public transport gate applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0				Most office, retail, bank and other environments.
	Low	1	0				Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)							

[a] A bent insertion path can result both from construction of the reader as well as placement of the reader, resulting in the card being bent at the insertion slot during insertion or withdrawal.

4.1.2 Corrected application profile

The usage frequency and the card lifetime in the field have a strong impact on the various stresses the card will have to withstand. The age coefficient (the expected card service life in years (at least 1)) and the usage coefficient (number of uses per day + 1) shall be applied to the raw application profile (A, U) to give a corrected application profile (A_c, U_c) as follows:

— $A_c = A \times$ the expected card service life in years (at least 1);

— $U_c = U \times$ (number of uses per day + 1).

4.2 Determination of the aging and usage classes

Determine the corrected application profile (A_c, U_c), as specified in 4.1. Then check the A_c value against Table 4 to determine the aging class of the application. Then check the U_c value against Table 5 to determine the usage class of the application.

Table 4 — Application aging class

A_c value	Aging class
0 – 10	0
> 10 – 20	1
> 20 – 50	2
> 50	3

Table 5 — Application usage class

U_c value	Usage class
0 – 10	A
> 10 – 20	B
> 20 – 50	C
> 50	D

5 Determination of the evaluation regime

5.1 General

Once the application profile has been specified, it is necessary to define the evaluations to be performed.

Two kinds of evaluation regime may be used to evaluate card service life:

— stand alone methods;

— evaluation sequences.

Stand alone methods are performed on card samples and the results are directly interpreted as an indication of the card's performance.

An evaluation sequence comprises a sequence of aging and usage simulation methods followed by a set of evaluation methods to determine an indication of the card's performance after exposure.

5.2 and 5.3 define evaluation regimes comprising sets of stand alone methods and evaluation sequences, respectively.

Only one of these evaluation regimes shall be selected in each case, in accordance with the guidance provided.

5.2 Evaluation regime using stand alone methods

This evaluation regime shall only be used when the following three conditions are met:

— the aging class is zero or one;

— the cards do not contain an IC;

— the cards are not embossed.

The evaluation methods given in Table 6, Table 7 and Table 8 may be used for all such cards.

Table 6 — ID card flexure to produce curvature of the width of the card in accordance with 5.10 of ISO/IEC 24789-2 – Minimum cycles to stopping point

		Aging class	
		0	**1**
Usage class	**A**	No requirement	No requirement
	B	No requirement	10 000
	C	10 000	25 000
	D	25 000	80 000
NOTE Flexure to produce curvature of the width (B) axis is known in some parts of the industry as “A Flex”			

Table 7 — ID card flexure to produce curvature of the height of the card in accordance with 5.10 of ISO/IEC 24789-2 - Minimum cycles to stopping point

		Aging class	
		0	**1**
Usage class	**A**	No requirement	No requirement
	B	No requirement	5 000
	C	5 000	12 500
	D	12 500	40 000
NOTE Flexure to produce curvature of the height (A) axis is known in some parts of the industry as “B Flex”			

Table 8 — Temperature and humidity aging followed by peel strength in accordance with 5.11 of ISO/IEC 24789-2 - Minimum peel strength values (N/mm)

		Aging class	
		0	1
Usage class	**A**	No requirement	No requirement
	B	No requirement	0,35 (2,00 lb_f/in)
	C	0,35 (2,00 lb_f/in)	0,70 (4,00 lb_f/in)
	D	0,70 (4,00 lb_f/in)	1,00 (5,71 lb_f/in)
NOTE 1 The duration of exposure to temperature and humidity aging shall be 168 hours.			
NOTE 2 Where the peel strength test fails to separate the card layers, the result exceeds the minimum requirement.			

5.2.1 Cards that have magnetic stripes

The following evaluation method shall only be used for cards bearing a magnetic stripe.

Table 9 — Magnetic stripe abrasion in accordance with 5.3 of ISO/IEC 24789-2 - Minimum abrasion cycles while $U_A > 0{,}70\ U_{A\ initial}$

		Aging class	
		0	1
Usage class	**A**	No Requirement	100
	B	100	200
	C	200	300
	D	300	500

5.2.2 Cards with surface printing and security devices

The following evaluation methods shall only be used for cards that have personalisation, printing, security devices and similar artifacts at or near the surface of the cards.

Table 10 — Surface abrasion in accordance with 5.2 of ISO/IEC 24789-2 - Minimum cycles to stopping point

		Aging class	
		0	1
Usage class	**A**	No Requirement	50
	B	50	300
	C	300	600
	D	600	1 000

Table 11 — Delamination – Cross cut tape test in accordance with 5.12 of ISO/IEC 24789-2 - Maximum grade 0 – 5 (0 = best)

		Aging class	
		0	1
Usage class	**A**	4	4
	B	4	3
	C	3	1
	D	1	0

5.3 Evaluation regime using evaluation sequences

The following evaluation regime may be used in all cases.

It shall be used in cases where the use of stand alone methods is not permissible i.e. where any of the following conditions are met:

— the aging class is 2 or 3;

— the card contains an IC;

— the card is embossed.

5.3.1 Designing a sequential evaluation of aging

The following defines the sequential test model and the method for designing the minimum sequence.

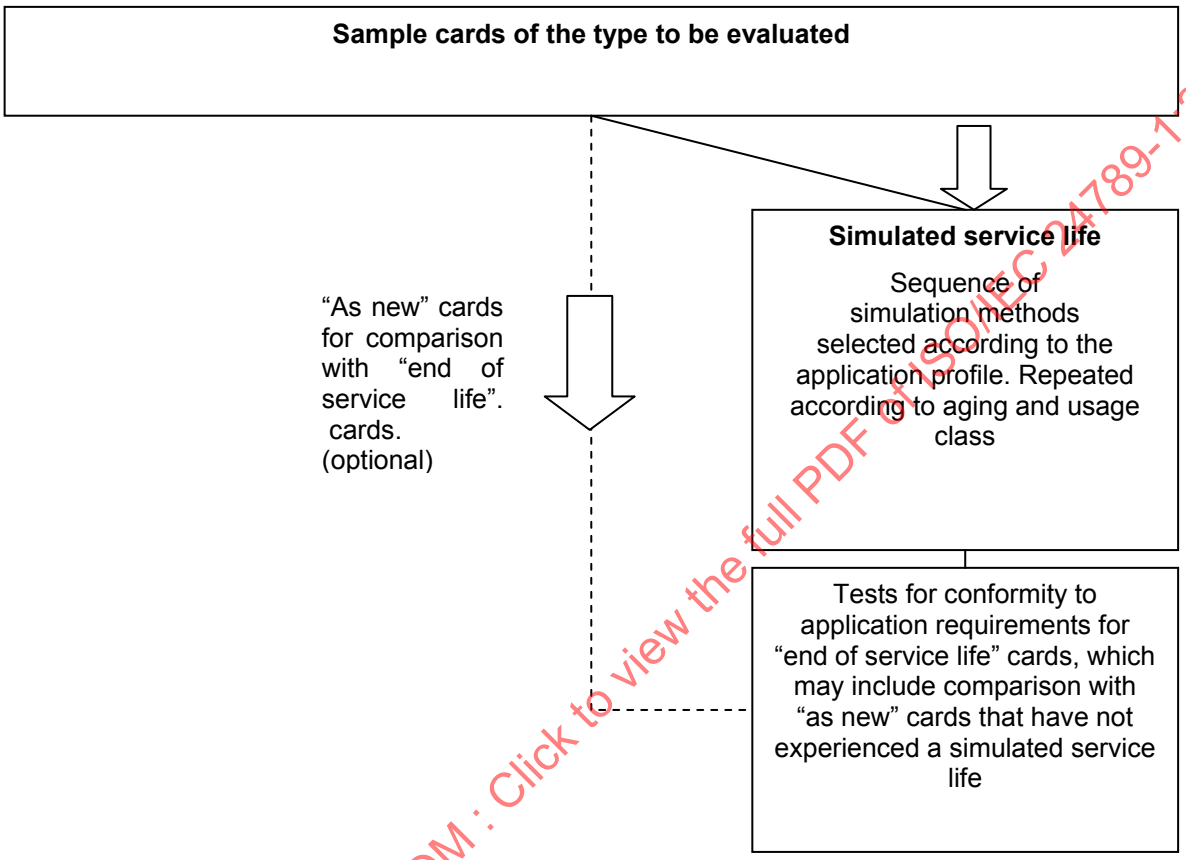

Figure 1 — Generic aging evaluation sequence

Simulated service life sequences consist of a number of simulation cycles that include at least:

— aging simulation methods (e.g. temperature and humidity exposure, resistance to chemicals);

— usage simulation methods (e.g. dynamic bending stress).

These may be selected from the evaluation methods given in ISO/IEC 24789-2 or adapted from relevant card testing standards. Usage simulation methods like dynamic bending stress shall always be applied at the end of an aging cycle.

If no such methods are selected the simulation cycle shall comprise at least:

— temperature and humidity aging;

— dynamic bending stress.

The total number of bending cycles and the exposure time for temperature and humidity aging shall be taken from Table 12 in accordance with the aging class and the usage class:

Table 12 — Minimum simulated service life sequence

		Aging class (= number of simulation cycles)			
		0	**1**	**2**	**3**
Usage class	**A**	There is no requirement for embossed or IC cards. See 5.2 for all other cards with aging class 0.	1500 cycles 48 h	2000 cycles 96 h	2400 cycles 144 h
	B		2500 cycles 48 h	3000 cycles 96 h	3600 cycles 144 h
	C		3500 cycles 48 h	4000 cycles 96 h	4500 cycles 144 h
	D		4500 cycles 48 h	5000 cycles 96 h	5400 cycles 144 h

The number of bending cycles for a single simulation cycle shall be the total number from the table divided by the aging class.

The temperature and humidity aging time for a single simulation cycle shall be the total storage time from the table divided by the aging class.

The evaluation sequence shall include at least:

— visual evaluation (e.g. recognisability);

— verification that the machine readable functions of the card are preserved (e.g. the card is testably functional according to ISO/IEC 10373, or the card operates as intended according to ISO/IEC 14443) or are as specified elsewhere for the product;

— verification of physical integrity (e.g. peel test).

5.3.2 Select the tests

Refer to Table 13 and Table 14 to select the tests for card service life evaluation according to the technology and the application. They may be used stand-alone if not used for the aging part of the sequence.

Select at least one conformity test from Table 14.

NOTE Careful account should be taken of the conditions of the application before deciding on the appropriate set of tests as not all tests check marked may be suitable or necessary for specific applications.

Table 13 — Available tests for different card technologies

		Card has:						
Document reference	**Test name**	**Personalisation layer**	**Embossing**	**Magnetic stripe**	**Integrated circuit(s) (IC) with contacts**	**Contactless IC**	**Dual interface**	**Optical memory**
	Aging simulation methods:							
ISO/IEC 24789-2	Xenon arc light exposure	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Surface abrasion	✓		✓	✓	✓	✓	✓
ISO/IEC 24789-2	Magnetic stripe abrasion			✓				
ISO/IEC 24789-2	Plasticised vinyl storage	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Wear and soil test	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Temperature and humidity aging	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Temperature shock	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Temperature and humidity cycling	✓	✓	✓	✓	✓	✓	✓
	Usage simulation methods:							
ISO/IEC 10373-1	Dynamic bending stress				✓	✓	✓	✓
ISO/IEC 24789-2	ID-1 card flexure	✓		✓				
ISO/IEC 24789-2	IC-module adhesion				✓		✓	
ISO/IEC 10373-1:2006 /AMD 1:2008	Mechanical strength - 3 wheel test				✓	✓	✓	
ISO/IEC 24789-2	Shortened bendings				✓		✓	
	Tests for conformity:							
ISO/IEC 10373-1	Delamination 90 °	✓	✓	✓	✓	✓	✓	✓
ISO/IEC 24789-2	Cross-cut test	✓						
ISO/IEC 10373-2	Magnetic stripe adhesion			✓				

NOTE 1 If the card is exposed to vibration as a major factor in the application profile, ensure methods testing resistance against vibrational stress, e.g. the wear and soil test, are included in the test sequence.

NOTE 2 The shortened bendings method is listed here for information only. It is described in an informative Annex in ISO/IEC 24789-2.

Table 14 — Available tests and their suitability for conformity testing, aging simulation, usage simulation and stand alone testing

Document reference	Method name	Conformity testing[a)]	Aging simulation[c)]	Usage simulation[d)]	Stand alone test
ISO/IEC 10373-1	Dimensions of cards (returned card criteria)				✓
ISO/IEC 10373-1	Card warpage (returned card criteria)				✓
ISO/IEC 24789-2	Cross-cut test [b)]	✓			✓
ISO/IEC 24789-2	Xenon arc light exposure [b) e)]	✓	✓		✓
ISO/IEC 24789-2	Surface abrasion [b)]	✓			✓
ISO/IEC 24789-2	Magnetic stripe abrasion [b)]	✓			✓
ISO/IEC 24789-2	IC-module adhesion [b)]	✓			✓
ISO/IEC 24789-2	Plasticised vinyl storage [b)]		✓		
ISO/IEC 24789-2	Wear and soil test [b)]		✓		
ISO/IEC 24789-2	Temperature and humidity aging [b)]		✓		
ISO/IEC 24789-2	Temperature shock [b)]		✓		
ISO/IEC 24789-2	Temperature and humidity cycling [b)]		✓		
ISO/IEC 24789-2	Shortened bendings [b) f)]			✓	✓
ISO/IEC 10373-1	Dynamic bending stress [b)]	✓		✓	✓
ISO/IEC 24789-2	ID-1 card flexure [b)]	✓		✓	✓
ISO/IEC 10373-1 AM1:2009	Mechanical strength - 3 wheel test [b) f)]	✓		✓	✓
ISO/IEC 10373-1 (definition)	Testably functional	✓			
	Visual examination[g)]	✓			
ISO/IEC 10373-1	Peel strength [b)]	✓			✓
ISO/IEC 10373-1	Resistance to chemicals (artificial perspiration) [b)]		✓		✓

Table 14 (*continued*)

Document reference	Method name	Conformity testing[a)]	Aging simulation[c)]	Usage simulation[d)]	Stand alone test
ISO/IEC 10373-1	Resistance to chemicals (fuel B) [b) h)]		✓		✓

NOTE The shortened bendings method is listed here for information only. It is described in an informative Annex in ISO/IEC 24789-2.

a) Test is suitable for use where there is to be comparison with "as new" cards
b) Test is destructive so two different sets of cards will be required if there is to be comparison with "as new" cards.
c) Test is suitable for aging cycle(s)
d) Test parameters depending on usage class
e) Special test cards may be required to allow testing of a sufficient area of colour. Furthermore, applications may wish to place different weightings on different colours or security printed elements in specified locations on the card.
f) If the IC does not lie within the contact area defined in ISO/IEC 7816-2 then neither of these applies.
g) To be defined between test lab and customer
h) Fuel B exposure is to be included in the sequence only when the application specifically requires exposure to petroleum distillates·

5.3.3 Establish the test sequence parameters

Determine the required test sequence parameters as illustrated by the example(s) shown in Annex B.

5.3.4 Perform the tests

Perform the resulting number of simulation cycles. The number of simulation cycles is equal to the aging class as shown in Table 4.

After completing the full number of simulation cycles, evaluate the condition of the cards using the specified method(s). Evaluations may be done after each simulation cycle if desired but this will require a greater number of test cards if the evaluation method is destructive.

Annex A
(informative)

Example application profiles

The following examples are supplied to show how application profiles are calculated. The examples are based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

A.1 Example profile - healthcare card

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 5 years;

— used once every 10 days;

— IC card with contacts.

Table A.1 — Environmental factors for the healthcare card

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low (below 5°C)	1	0	0,1	0,1	0	
	High (30°C to 50°C)	2	0	0,1	0,2	0	
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0	0,5	0	0	
	> 1 per week and <=1 per day	2	0,6	0,4	0,8	0,24	
	> 1 per day and <=3 per day	3	0,9	0,1	0,3	0,09	
	>3 per day	5	1,5				
Relative humidity	Normal (30 % to 70 %)	0	0	0,9	0	0	
	Dry (< 30%)	1	0	0,1	0,1	0	
	Humid (> 70 %)	3	0				

Table A.1 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Daylight	None	0	0	1	0	0	Normally carried in a wallet or a bag.
	Indoor	1	0				Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	1	0	0	Residential, office or retail environment.
	Medium	2	0				Light factory environment; outdoor ID badge usag.e
	High	5	0				Car repair or heavy factory environment.
Sum (*A*, *U*)					1,5	0,33	

Table A.2 — Storage factors for the healthcare card

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1	0,5	0	0,5	Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2	0,3	0	0,6	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,2	0	1	Multiple cards shingled in wallet in trouser pocket; single card loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0	0,7	0	0	Card always remains in holder, e.g. PICC.
	Low	1	0	0,2	0,2	0	Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0	0,1	0,2	0	Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder.
	High	5	0				Inserted in reader in vehicle, loose in pocket or bag.

Table A.2 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1	0,4	0	0,4	Wallet in purse or handbag, cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,4	0	0,8	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5	0,2	0	1	Loose in bag or pocket.
Sum (*A*, *U*)					0,4	4,3	

Table A.3 — Reader factors for the healthcare card

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller)	None	0	0				PICC or VICC reader.
	Low	0	1	0,7	0	0,7	Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2	0,3	0	0,6	Contact IC card reader with bent insertion path.
	High	0	3				Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0	0,8	0	0	PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1	0,2	0	0,2	Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader where construction or installation results in bending of the card.
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0	1	0	0	Insertion readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1				Magnetic stripe swipe reader.
	Medium	0	2				PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.

Table A.3 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0	0,8	0	0	Most office, retail, bank and other environments.
	Low	1	0	0,2	0,2	0	Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					0,2	1,5	

The sum of environmental factors, storage factors and reader factors provides the raw application profile as shown in Table A.4.

Table A.4 — Raw application profile for the healthcare card

Raw factors	Age	Usage
Environment	1,5	0,33
Storage	0,4	4,3
Reader	0,2	1,5
Sum *A*,*U*	2,1	6,13

Applying the age and usage correction factors corresponding to the expected lifetime and the frequency of use and multiplying these values with the raw application profile factors calculates the corrected application profile, as shown in Table A.5.

Table A.5 — Corrected application profile for the healthcare card

Correction factors	Age	Usage
Card service life [years]	5	
Uses/day		0,1
Age coefficient	5	
Usage coefficient		1,1
A_c, U_c	10,5	6,743

The corrected application profile for the healthcare card application (A_c,U_c) is (1,A), written as **1A**.

A.2 Example profile - national ID card

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 10 years;

— used once every day;

— dual interface card;

— primarily use of the contactless interface.

Table A.6 — Environmental factors for the national ID card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low below 5°C)	1	0				
	High (30°C to 50°C)	2	0	0,2	0,4	0	
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0	0,9	0	0	
	> 1 per week and <=1 per day	2	0,6	0,1	0,2	0,06	
	> 1 per day and <=3 per day	3	0,9				
	>3 per day	5	1,5				
Relative humidity	Normal (30% to 70%)	0	0	0,8	0	0	
	Dry (< 30%)	1	0	0,05	0,05	0	
	Humid (> 70 %)	3	0	0,15	0,45	0	
Daylight	None	0	0	0,9	0	0	Normally carried in a wallet or a bag.
	Indoor	1	0	0,1	0,1	0	Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	1	0	0	Residential, office or retail environment.
	Medium	2	0				Light factory environment; outdoor ID badge usage.
	High	5	0				Car repair or heavy factory environment.
Sum (*A*, *U*)					1,2	0,06	

Table A.7 — Storage factors for the national ID card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0	0,1	0	0	Hard plastic holder.
	Low	0	1	0,25	0	0,25	Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2	0,25	0	0,5	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,4	0	2	Multiple cards shingled in wallet in trouser pocket; single card, loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0				Card always remains in holder, e.g. PICC.
	Low	1	0	0,5	0,5	0	Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0	0,5	1	0	Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder
	High	5	0				Inserted in reader in vehicle; loose in pocket or bag.
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1	0,6	0	0,6	Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,2	0	0,4	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5	0,2		1	Loose in bag or pocket.
Sum (*A*, *U*)					1,5	4,75	

Table A.8 — Reader factors for the national ID card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller)	None	0	0	0,8	0	0	PICC or VICC reader.
	Low	0	1				Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2				Contact IC card reader with bent insertion path.
	High	0	3	0,2		0,6	Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0	1	0	0	PICC or VICC reader, Motorized card reader; low friction insertion readers.
	Low	0	1				Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader where construction or installation results in bending of the card.
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0	0,8	0	0	Insertion readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1				Magnetic stripe swipe reader.
	Medium	0	2	0,2	0	0,4	PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0	1	0	0	Most office, retail, bank and other environments.
	Low	1	0				Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					0	1,0	

The sum of environmental factors, storage factors and reader factors provides the raw application profile as shown in Table A.9.

Table A.9 — Raw application profile for the national ID card

Raw factors	Age	Usage
Environment	1,2	0,06
Storage	1,5	4,75
Reader	0	1,0
Sum *A*, *U*	2,7	5,81

Applying the age and usage correction factors corresponding to the expected lifetime and the frequency of use and multiplying these values with the raw application profile factors calculates the corrected application profile, as shown in Table A.10.

Table A.10 — Corrected application profile for the national ID card

Correction factors	Age	Usage
Card service life [years]	10	
Uses/day		1
Age coefficient	10	
Usage coefficient		2
A_c, U_c	27	11,62

The corrected application profile for the national ID card application (A_c,U_c) is (2,B), written as **2B**.

A.3 Example profile - transportation card

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 5 years;

— used 4 times every day;

— contactless IC card.

The card service life parameters are chosen from an application with light usage and a 5 year anticipated lifetime.

Table A.11 — Environmental factors for the light usage, 5 year life transportation card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low (below 5°C)	1	0				
	High (30°C to 50°C)	2	0	0,2	0,4	0	
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0				
	> 1 per week and <=1 per day	2	0,6	0,8	1,6	0,48	
	> 1 per day and <=3 per day	3	0,9	0,2	0,6	0,18	
	>3 per day	5	1,5				
Relative humidity	Normal (30% to 70%)	0	0	1	0	0	
	Dry (< 30%)	1	0				
	Humid (> 70%)	3	0				
Daylight	None	0	0				Normally carried in a wallet or a bag.
	Indoor	1	0	1	1	0	Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	0,5	0	0	Residential, office or retail environment.
	Medium	2	0	0,5	1	0	Light factory environment; outdoor ID badge usage.
	High	5	0				Car repair or heavy factory environment.
Sum (*A*, *U*)					4,6	0,66	

Table A.12 — Storage factors for the light usage, 5 year life transportation card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2	0,8	0	1,6	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,2	0	1	Multiple cards shingled in wallet in trouser pocket; single card loose or in paper sleeve or in soft plastic holder in pocket or bag
Physical stress (friction)	None	0	0				Card always remains in holder, e.g. PICC.
	Low	1	0	0,5	0,5	0	Wallet in purse or handbag; cards stacked in holder or wallet, paper sleeve.
	Medium	2	0	0,5	1	0	Hard plastic holder; cards shingled in holder or wallet, wallet in trouser pocket; soft plastic holder.
	High	5	0				Inserted in reader in vehicle; loose in pocket or bag.
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1	0,8	0	0,8	Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,2	0	0,4	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5				Loose in bag or pocket.
Sum (*A*, *U*)					1,5	3,8	

Table A.13 — Reader factors for the light usage, 5 year life transportation card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller)	None	0	0	1	0	0	PICC or VICC reader.
	Low	0	1				Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2				Contact IC card reader with bent insertion path.
	High	0	3				Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0	1	0	0	PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1				Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader where construction or installation results in bending of the card.
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0				Insertion Readers; motorized readers; VICC readers; most PICC readers
	Low	0	1				Magnetic stripe swipe reader.
	Medium	0	2	1	0	2	PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0	1	0	0	Most office, retail, bank and other environments
	Low	1	0				Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					0	2	

The sum of environmental factors, storage factors and reader factors provides the raw application profile, as shown in Table A.14.

Table A.14 — Raw application profile for the light usage, 5 year life transportation card

Raw factors	Age	Usage
Environment	4,6	0,66
Storage	1,5	3,8
Reader	0	2
Sum A, U	6,1	6,46

Applying the age and usage correction factors corresponding to the expected lifetime and the frequency of use and multiplying these values with the raw application profile factors calculates the corrected application profile, as shown in Table A.15.

Table A.15 — Corrected application profile for the light usage, 5 year life transportation card

Correction factors	Age	Usage
Card service life [years]	5	
Uses/day		4
Age coefficient	5	
Usage coefficient		5
A_c, U_c	30,5	32,3

The corrected application profile for the light usage, 5 year lifetime, transportation card application (A_c, U_c) is (2,C), written as **2C**

A.4 Example profile - access card

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 5 years;

— used as access control token for building and personal computer access 8 to 10 times a day;

— dual interface card.

Table A.16 — Environmental factors for the access card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (p x age)	Usage points (p x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low (below 5°C)	1	0				
	High (30°C to 50°C)	2	0	0,2	0,4	0	
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0				
	> 1 per week and <=1 per day	2	0,6	0,8	1,6	0,48	
	> 1 per day and <=3 per day	3	0,9	0,2	0,6	0,18	
	>3 per day	5	1,5				
Relative humidity	Normal (30% to 70%)	0	0				
	Dry (< 30%)	1	0				
	Humid (> 70%)	3	0				
Daylight	None	0	0				Normally carried in a wallet or a bag.
	Indoor	1	0	0,8	0,8	0	Worn visibly as an ID badge indoors.
	Outdoor	5	0	0,2	1	0	Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	0,4	0	0	Residential, office or retail environment.
	Medium	2	0	0,5	1	0	Light factory environment; outdoor ID badge usage.
	High	5	0	0,1	0,5	0	Car repair or heavy factory environment.
Sum (*A*, *U*)					5,9	0,66	

Table A.17 — Storage factors for the access card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2	0,8	0	1,6	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,2	0	1	Multiple cards shingled in wallet in trouser pocket; single card loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0	0,6	0	0	Card always remains in holder, e.g. PICC.
	Low	1	0	0,2	0,2	0	Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0	0,2	0,4	0	Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder.
	High	5	0				Inserted in reader in vehicle; loose in pocket or bag.
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1	0,8	0	0,8	Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,2	0	0,4	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5				Loose in bag or pocket.
Sum (*A*, *U*)					0,6	3,8	

Table A.18 — Reader factors for the access card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller)	None	0	0	0,8	0	0	PICC or VICC reader.
	Low	0	1	0,2	0	0,2	Magnetic stripe or contact IC card reader with straight insertion path, motorized ATM reader with rollers running over the card.
	Medium	0	2				Contact IC card reader with bent insertion path.
	High	0	3				Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.

Table A.18 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (friction)	None	0	0	0,8	0	0	PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1	0,2	0	0,2	Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader where construction or installation results in bending of the card.
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0	1	0	0	Insertion Readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1				Magnetic stripe swipe reader
	Medium	0	2				PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0	0,9	0	0	Most office, retail, bank and other environments.
	Low	1	0	0,1	0,1	0	Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					0,1	0,4	

The sum of environmental factors, storage factors and reader factors provides the raw application profile, as shown in Table A.19.

Table A.19 — Raw application profile for the access card

Raw factors	Age	Usage
Environment	5,9	0,66
Storage	0,6	3,8
Reader	0,1	0,4
Sum *A*, *U*	6,6	4,86

Applying the age and usage correction factors corresponding to the expected lifetime and the frequency of use and multiplying these values with the raw application profile factors calculates the corrected application profile, as shown in Table A.20.

Table A.20 — Corrected application profile for the access card

Correction factors	Age	Usage
Card service life [years]	10	
Uses/day		10
Age coefficient	10	
Usage coefficient		11
A_c, U_c	66	53,46

The corrected application profile for the access card application (A_c,U_c) is (3,D), written as **3D**.

A.5 Example profile - magnetic stripe based campus card

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 5 years;

— used 5 times every day;

— magnetic stripe card.

Table A.21 — Environmental factors for the magnetic stripe based campus card

Factor	Condition	Age	Usage	Probability p of condition (sum=1)	Age points (p x age)	Usage Points (p x usage)	Examples and Guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low (below 5°C)	1	0	0,15	0,15	0	
	High (30°C to 50°C)	2	0	0,05	0,1	0	
	Very high (above 50°C)	5	0				
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0	0,9	0	0	
	> 1 per week and <=1 per day	2	0,6	0,1	0,2	0,06	
	> 1 per day and <=3 per day	3	0,9				
	>3 per day	5	1,5				

Table A.21 (*continued*)

Factor	Condition	Age	Usage	Probability p of condition (sum=1)	Age points (p x age)	Usage Points (p x usage)	Examples and Guidance
Relative humidity	Normal (30% to 70%)	0	0	0,8	0	0	
	Dry (< 30%)	1	0	0,1	0,1	0	
	Humid (> 70%)	3	0	0,1	0,3	0	
Daylight	None	0	0	1	0	0	Normally carried in a wallet or a bag.
	Indoor	1	0				Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	0,8	0	0	Residential, office or retail environment.
	Medium	2	0	0,2	0,4	0	Light factory environment; outdoor ID badge usage.
	High	5	0				Car repair or heavy factory environment.
Sum (A, *U*)					1,25	0,06	

Table A.22 — Storage factors for the magnetic stripe based campus card

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; inserted in reader in vehicle.
	Medium	0	2	0,5	0	1	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,5	0	2,5	Multiple cards shingled in wallet in trouser pocket; single card, loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0				Card always remains in holder, e.g. PICC.
	Low	1	0	0,5	0,5	0	Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0	0,3	0,6	0	Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder.
	High	5	0	0,2	1	0	Inserted in reader in vehicle; loose in pocket or bag.

Table A.22 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum=1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (compression)	None	0	0				Hard plastic holder.
	Low	0	1				Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,5	0	1	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5	0,5	0	2,5	Loose in bag or pocket.
Sum (*A*, *U*)					2,1	7	

Table A.23 — Reader factors for the magnetic stripe based campus card

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. pressure by roller)	None	0	0				PICC or VICC reader.
	Low	0	1	0,25	0	0,25	Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2	0,5	0	1	Contact IC card reader with bent insertion path.
	High	0	3	0,25	0	0,75	Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0				PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1				Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2				Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3	1	0	3	Magnetic stripe swipe reader where construction or installation results in bending of the card.

Table A.23 (*continued*)

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (impact, e.g. pressing the card against a contactless reader)	None	0	0				Insertion readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1	1	0	1	Magnetic stripe swipe reader.
	Medium	0	2				PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0	0,6	0	0	Most office, retail, bank and other environments.
	Low	1	0	0,2	0,2	0	Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0	0,2	0,4	0	Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					0,6	6	

The sum of environmental factors, storage factors and reader factors provides the raw application profile as shown in Table A.24.

Table A.24 — Raw application profile for the magnetic stripe based campus card

Raw factors	Age	Usage
Environment	1,25	0,06
Storage	2,1	7
Reader	0,6	6
Sum *A*, *U*	3,95	13,06

Applying the age and usage correction factors corresponding to the expected lifetime and the frequency of use and multiplying these values with the raw application profile factors calculates the corrected application profile, as shown in Table A.25.

Table A.25 — Corrected application profile for the magnetic stripe based campus card

Correction factors	Age	Usage
Card service life [years]	5	
Uses/day		5
Age coefficient	5	
Usage coefficient		6
A_c, U_c	19,75	78,36

The corrected application profile for the magnetic stripe campus card application (A_c,U_c) is (1,D), written as **1D**.

A.6 Example profile - driving licence

The following example is supplied to show how application profiles are calculated. The example is based on assumptions, which may not be appropriate for a specific application. The reader should select probabilities representative for their specific application.

The underlying assumptions for the following application profile calculation are:

— projected lifetime of 10 years;

— used once every 10 days;

— dual interface card.

Table A.26 — Environmental factors for the driving licence

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Temperature	Normal (5°C to 30°C)	0	0	0,8	0	0	
	Low (below 5°C)	1	0	0,05	0,05	0	
	High (30°C to 50°C)	2	0	0,1	0,2	0	
	Very high (above 50°C)	5	0	0,05	0,25	0	
Temperature changes (transition between any two of the above temperature ranges)	<=1 per week	0	0	0,7	0	0	
	> 1 per week and <=1 per day	2	0,6	0,2	0,4	0,12	
	> 1 per day and <=3 per day	3	0,9	0,1	0,3	0,09	
	>3 per day	5	1,5				
Relative Humidity	Normal (30% to 70%)	0	0	0,8	0	0	
	Dry (< 30%)	1	0	0,1	0,1	0	
	Humid (> 70%)	3	0	0,1	0,3	0	
Daylight	None	0	0	1	0	0	Normally carried in a wallet or a bag.
	Indoor	1	0				Worn visibly as an ID badge indoors.
	Outdoor	5	0				Worn visibly as an ID badge outdoors, e.g. at a building site or as a ski-pass.
Chemicals and particulate exposure (e.g. sand and dust, oils and fats, corrosive gases, salt)	Low	0	0	1	0	0	Residential, office or retail environment.
	Medium	2	0				Light factory environment; outdoor ID badge usage.
	High	5	0				Car repair or heavy factory environment.
Sum (*A*, *U*)					1,6	0,21	

Table A.27 — Storage factors for the driving licence

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending)	None	0	0				Hard plastic holder.
	Low	0	1	0,3	0	0,3	Wallet in purse or handbag, inserted in reader in vehicle.
	Medium	0	2	0,4	0	0,8	Multiple cards stacked in holder or wallet in trouser pocket.
	High	0	5	0,3	0	1,5	Multiple cards shingled in wallet in trouser pocket; single card loose or in paper sleeve or in soft plastic holder in pocket or bag.
Physical stress (friction)	None	0	0				Card always remains in holder, e.g. PICC.
	Low	1	0	0,5	0,5	0	Wallet in purse or handbag; cards stacked in holder or wallet; paper sleeve.
	Medium	2	0	0,5	1	0	Hard plastic holder; cards shingled in holder or wallet; wallet in trouser pocket; soft plastic holder.
	High	5	0				Inserted in reader in vehicle; loose in pocket or bag.
Physical stress (Compression)	None	0	0				Hard plastic holder.
	Low	0	1	0,3	0	0,3	Wallet in purse or handbag; cards stacked in holder or wallet; inserted in reader in vehicle.
	Medium	0	2	0,4	0	0,8	Multiple cards shingled in holder or wallet; wallet in trouser pocket.
	High	0	5	0,3	0	1,5	Loose in bag or pocket.
Sum (*A*, *U*)					1,5	5,2	

Table A.28 — Reader factors for the driving licence

Factor	Condition	Age	Usage	Probability *p* of condition (sum = 1)	Age points (*p* x age)	Usage points (*p* x usage)	Examples and guidance
Physical stress (bending, e.g. Pressure by roller)	None	0	0	0,3	0	0	PICC or VICC reader.
	Low	0	1	0,4	0	0,4	Magnetic stripe or contact IC card reader with straight insertion path; motorized ATM reader with rollers running over the card.
	Medium	0	2	0,3	0	0,6	Contact IC card reader with bent insertion path.
	High	0	3				Magnetic stripe swipe reader; poor ergonomics of the reader location resulting in bending of the card during insertion/withdrawal; rough mechanical handling.
Physical stress (friction)	None	0	0	0,7	0	0	PICC or VICC reader; motorized card reader; low friction insertion readers.
	Low	0	1				Low friction insertion readers; magnetic stripe swipe reader, where construction and installation prevent bending of the card.
	Medium	0	2	0,3	0	0,6	Medium friction insertion readers, e.g. with clamping device for in-car use.
	High	0	3				Magnetic stripe swipe reader where construction or installation results in bending of the card.
Physical stress (Impact, e.g. pressing the card against a contactless reader)	None	0	0	0,7	0	0	Insertion Readers; motorized readers; VICC readers; most PICC readers.
	Low	0	1				Magnetic stripe swipe reader.
	Medium	0	2	0,3	0	0,6	PICC reader in public transport gate-applications.
	High	0	3				Rough mechanical handling.
Reader contamination (resulting in deposits inside the reader causing abrasion)	None	0	0				Most office, retail, bank and other environments.
	Low	1	0	1	1	0	Insertion or swipe reader installed in dusty/sandy/oily environment with good maintenance and a low level of transactions.
	Medium	2	0				Insertion or swipe reader installed in dusty/sandy/oily environment with poor maintenance or a high level of transactions.
	High	3	0				Reader installed in dusty/sandy/oily environment or outdoors, with poor maintenance and a high level of transactions.
Sum (*A*, *U*)					1	2,2	