

Identification card systems — Intersector thin flexible cards —

Part 3: Test methods

The European Standard EN 753-3:1999 has the status of a
British Standard

ICS 35.240.15

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

National foreword

This British Standard is the English language version of EN 753-3:1999.
The UK participation in its preparation was entrusted to Technical Committee IST/17, Identification cards and related devices, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 43 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the DISC Board, was published under the authority of the Standards Committee and comes into effect on 15 December 1999

© BSI 12-1999

ISBN 0 580 35218 8

Amendments issued since publication

Amd. No.	Date	Comments

English version

Identification card systems — Intersector thin flexible cards — Part 3: Test methods

Systèmes de cartes d'identification - Cartes souples minces
intersectorielles - Partie 3: Méthodes d'essai

Identifikationskartensysteme - Branchenübergreifende
dünne biegsame Karten - Teil 3: Prüfverfahren

This European Standard was approved by CEN on 1 July 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword 5

Introduction 6

1 Scope..... 7

2 Normative references 7

3 Terms and definitions 8

4 Symbols and abbreviations 12

5 Test methods for the general technical specification 13

5.1 General 13

5.1.1 Reference 13

5.1.2 Apparatus..... 13

5.1.3 Sampling, preparation and storage of samples 13

5.1.4 Conditioning and testing environment 14

5.1.5 Test report..... 14

5.2 Dimensions (except thickness) 14

5.2.1 Reference 14

5.2.2 Principle 14

5.2.3 Procedure..... 14

5.3 Thickness 14

5.3.1 Paper or composite cards thickness 14

5.3.2 Plastic cards thickness 15

5.4 Separation force 15

5.4.1 Reference 15

5.4.2 Principle 15

5.4.3 Apparatus..... 15

5.4.4 Procedure..... 15

5.4.5 Expression of result..... 15

5.5 Reel winding 16

5.5.1 Reference 16

5.5.2 Apparatus..... 16

5.5.3 Procedure..... 16

5.6 Bursting strength 17

5.6.1 Reference 17

5.6.2 Procedure..... 17

5.7 Stiffness 17

5.7.1 Reference 17

5.7.2 Procedure..... 17

5.8 Folding endurance 17

5.8.1 Reference 17

5.8.2 Apparatus..... 17

5.8.3 Procedure..... 17

5.9 Tensile strength..... 17

5.9.1 Paper and composite card tensile strength 17

5.9.2 Plastic card tensile strength 18

5.10 Ash content..... 18

5.10.1 Reference 18

5.10.2 Procedure..... 18

5.11 Hygro-expansivity 18

5.11.1 Reference 18

5.11.2 Apparatus..... 18

5.11.3 Procedure..... 18

5.11.4 Expression of results..... 18

5.12 Smoothness..... 18

5.12.1 Reference 18

5.12.2	Procedure	19
5.13	Opacity	19
5.13.1	Reference	19
5.13.2	Procedure	19
5.14	Coefficient of friction	19
5.14.1	Reference	19
5.14.2	Procedure	19
5.15	Reflectance factor	20
5.15.1	Reference	20
5.15.2	Procedure	20
5.16	Air permeance	20
5.16.1	Reference	20
5.16.2	Procedure	20
5.17	Sizing and pen-writing factor	20
5.17.1	Reference	20
5.17.2	Principle	20
5.17.3	Apparatus and reagents	20
5.17.4	Preparation of test pieces	21
5.17.5	Procedure	22
5.17.6	Expression of results	23
5.18	Tear resistance	23
5.18.1	Reference	23
5.18.2	Procedure	23
5.19	Delamination resistance	23
5.19.1	Reference	23
5.19.2	Principle	23
5.19.3	Apparatus	24
5.19.4	Preparation for test	24
5.19.5	Procedure	25
5.19.6	Expression of results	26
5.19.7	Test report	26
5.20	Cold-crack temperature (brittleness)	28
5.20.1	Reference	28
5.20.2	Procedure	28
5.20.3	Expression of results	28
5.21	Electrical conductivity	29
5.21.1	Reference	29
5.21.2	Procedure	29
6	Test methods for magnetic stripe physical characteristics	29
6.1	Preparation and storage of samples	29
6.2	Conditioning and test environments	29
6.3	Protrusion	29
6.3.1	Reference	29
6.3.2	Principle	29
6.3.3	Apparatus	30
6.3.4	Procedure	30
6.4	Profile deviation	30
6.4.1	Reference	30
6.4.2	Principle	30
6.4.3	Procedure	30
6.5	Roughness R_a and R_z	31
6.5.1	Reference	31
6.5.2	Principle	31
6.5.3	Procedure	31
6.6	Warpage	31
6.6.1	Reference	31
6.6.2	Procedure	32
6.7	Adherence	32
6.7.1	Reference	32
6.7.2	Apparatus	32
6.7.3	Procedure	32
6.8	Wear test	32
6.8.1	Reference	32

6.8.2	Principle	32
6.8.3	Procedure.....	32
6.9	Dimensional measurement of the magnetic stripe.....	33
6.9.1	Principle	33
6.9.2	Procedure.....	33
7	Test methods for static magnetic characteristics	33
7.1	Principle	33
7.2	Apparatus.....	33
7.3	Preparation and storage of samples	34
7.3.1	Preparation	34
7.3.2	Storage	34
7.3.3	Conditioning and testing environment	34
7.4	Procedure.....	34
7.5	Expression of results.....	35
7.6	Coercivity, H_{cM}	35
7.6.1	Reference	35
7.6.2	Procedure.....	35
7.7	Squareness, SQ.....	35
7.7.1	Reference	35
7.7.2	Procedure.....	36
7.8	Switching field distribution, (SFD)	36
7.8.1	Reference	36
7.8.2	Procedure.....	36
7.9	Test report.....	36
8	Test method for dynamic magnetic characteristics	37
8.1	Principle	37
8.2	Reference cards	37
8.3	Apparatus.....	37
8.3.1	Measuring instrument for classes L and S.....	37
8.3.2	Measuring instrument for class H	37
8.3.3	Measuring instrument for class V	37
8.4	Preparation and preservation of test samples	38
8.4.1	Preparation	38
8.4.2	Preservation.....	38
8.4.3	Conditioning and testing environment	38
8.5	Procedures.....	38
8.5.1	Test procedure for classes S and L	38
8.5.2	Test procedure for class H.....	38
8.5.3	Test procedure for class V	39
8.6	Expression of results.....	39
8.6.1	Resolution.....	39
8.6.2	Modulation	40
8.7	Test report.....	40
Annex A (informative)	Dye solutions	41
Bibliography		42

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 224, Machine-readable cards, related device interfaces and operations, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This document is made of three parts:

- *Part 1: General technical specifications;*
- *Part 2: Magnetic recording technique;*
- *Part 3: Test methods.*

Introduction

Thin flexible cards (TFCs), the subject of this European Standard, are used to automate the controls for access to goods or services such as mass transit, highway toll systems, car parks, vouchers, stored value, etc.

In order to ensure repeatability and reproducibility wherever possible test methods for the general technical specification are based upon those of the paper and plastics industries. Likewise the tests for magnetic recording technique correspond to those used for magnetic stripes on ID-1 cards defined in ISO/IEC 7811-2:1995 and ISO/IEC 7811-6:1996.

1 Scope

This European Standard specifies the test methods and procedures required to carry out measurements of the TFC characteristics specified in EN 753-1:1997 and EN 753-2:1997.

Many of the standard methods available for checking physical properties of base materials are intended to be applied to samples cut from continuous material or large sheets. Within the scope of EN 753 however, it shall be clearly understood that all requirements of EN 753, unless explicitly stated otherwise, apply to finished cards.

The test methods described in this European Standard are to be performed on separate samples. It is not intended that any individual card should pass through more than one test procedure, unless explicitly stated.

Acceptance criteria do not form part of this standard; they are discussed in a CEN Technical Report.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 753-1:1997, *Identification card systems - Intersector thin flexible cards - Part 1: General technical specifications*.

EN 753-2:1997, *Identification card systems - Intersector thin flexible cards - Part 2: Magnetic recording technique*.

EN ISO/IEC 10373:1995, *Identification cards - Test methods (ISO/IEC 10373:1993)*.

EN 20187, *Paper, board and pulps - Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples (ISO 187:1990)*.

EN 20284, *Conveyor belts - Electrical conductivity - Specification and method of test (ISO 284:1982)*.

EN 20534, *Paper and board - Determination of thickness and apparent bulk density or apparent sheet density (ISO 534:1988)*.

ISO 186, *Paper and board - Sampling to determine average quality*.

ISO 291, *Plastics - Standard atmospheres for conditioning and testing*.

ISO 527-3, *Plastics - Determination of tensile properties - Part 3: Test conditions for films and sheets*.

ISO 1831, *Printing specifications for optical character recognition*.

ISO 1924-2, *Paper and board - Determination of tensile properties - Part 2: Constant rate of elongation method*.

ISO 2144, *Paper and board - Determination of ash*.

ISO 2409, *Paints and varnishes - Cross-cut test*.

ISO 2471, *Paper and board - Determination of opacity (paper backing) - Diffuse reflectance method*.

ISO 2758, *Paper - Determination of bursting strength*.

ISO 3274, *Geometrical Product Specifications (GPS) – Surface texture: Profile method – Nominal characteristics of contact (stylus) instruments*.

ISO 4094, *Paper, board and pulps - International calibration of testing apparatus - Nomination and acceptance of standardizing and authorized laboratories.*

ISO 4287-1, *Surface roughness - Terminology - Part 1: Surface and its parameters.*

ISO 4593, *Plastics - Film and sheeting - Determination of thickness by mechanical scanning.*

ISO 5626, *Paper - Determination of folding endurance.*

ISO 5627, *Paper and board - Determination of smoothness (Bekk method).*

ISO 5629, *Paper and board - Determination of bending stiffness - Resonance method.*

ISO 5636-3, *Paper and board - Determination of air permeance (medium range) - Part 3: Bendtsen method.*

ISO 6383-2, *Plastics - Film and sheeting - Determination of tear resistance - Part 2: Elmendorf method.*

ISO/IEC 7811-2:1995, *Identification cards - Recording technique - Part 2: Magnetic stripe.*

ISO/IEC 7811-6:1996, *Identification cards - Recording technique - Part 6: Magnetic stripe - High coercivity.*

ISO 8226-2, *Paper and board - Measurement of hygroexpansivity - Part 2: Hygroexpansivity up to a maximum relative humidity of 86 %.*

ISO 8295, *Plastics - Film and sheeting - Determination of the coefficients of friction.*

ISO 8570, *Plastics - Film and sheeting - Determination of cold-crack temperature.*

IEC 50(221), *International Electrotechnical Vocabulary - Chapter 221: Magnetic materials and components.*

IEC 454-2, *Specifications for pressure - sensitive adhesive tapes for electrical purposes - Part 2: Methods of test.*

3 Terms and definitions

For the purposes of this European Standard, the following definitions apply:

3.1

average signal amplitude (U_A)

the arithmetic mean of the absolute values of the individual signal amplitudes found in a readback voltage waveform

$$U_A = \frac{\sum_{k=1}^n |U_{ik}|}{n} \quad (\text{where } n \text{ is the number of individual signal amplitudes})$$

Five such values are specified in EN 753-2 :

- U_{A1} : average value after recording at $D_{\min}$ and $I_{\min}$;
- U_{A2} : average value after recording at $D_{\min}$ and $I_{\max}$;
- U_{A3} : average value after recording at $D_{\max}$ and $I_{\max}$;
- U_{A4} : average value after recording at $D_{\min}$ and $I_{\max}$ then erasing at $I_{\min}$;
- U_{A5} : average value after recording at $D_{\max}$ and $I_{\min}$ then erasing at d/I_R [EN 753-2:1997]

3.2

back

the face of the card opposite the front [EN 753-1:1997]

3.3

central stripe

a stripe centred on the widthwise axis of the card [EN 753-2:1997]

3.4

coercive field strength

the magnetic field strength for which the magnetization is zero [IEC 50(221)]

3.5

coercivity (H_{cM})

the value of coercive field strength obtained when the material is brought from saturation by a monotonically changing field [IEC 50(221)]

3.6

composite

material made from at least two layers of different material, one of which is paper

3.7

erase noise level

the level of the noise signal which is read from an erased magnetic stripe. EN 753-2 controls erase noise level via the quantities U_{A4} and U_{i4} [EN 753-2:1997]

3.8

erasure

the attenuation of a magnetic encoding signal by re-magnetizing the track area in a single direction, parallel to the width of the stripe [EN 753-2:1997]

3.9

finished card

card at the point of issue to the public [EN 753-1:1997]

3.10

front

the reference face of the card (which normally bears printed information relating to its origin and ownership) [EN 753-1:1997]

3.11

height

the dimension parallel to the shortest edge of the card [EN 753-1:1997]

3.12

high coercivity (HiCo)

coercivity values around 270 kA/m; magnetic stripes whose magnetic characteristics conform to those given in EN 753-2 for class H magnetics [EN 753-2:1997]

3.13

individual signal amplitude (U_i)

the base to peak amplitude of a single readback signal pulse. Four such quantities are specified in EN 753-2:1997:

- U_{i1} : maximum value after recording at $D_{\min}$ and $I_{\min}$;
- U_{i2} : range of values after recording at $D_{\max}$ and $I_{\max}$;
- U_{i4} : maximum value after recording at $D_{\min}$ and $I_{\max}$ then erasing at $I_{\min}$;
- U_{i5} : minimum value after recording at $D_{\max}$ and $I_{\min}$ then erasing at dI_R [EN 753-2:1997]

3.14

lateral stripe

any widthwise stripe which is not centred on the widthwise axis of the card [EN 753-2:1997]

3.15

low coercivity (LoCo)

coercivity values around 25 kA/m; magnetic stripes whose magnetic characteristics conform to those given in EN 753-2 for class L magnetics [EN 753-2:1997]

3.16

lower density (LD)

the range of encoding densities given in EN 753-2 for class w encoding (≤ 3 bits/mm) [EN 753-2:1997]

3.17

maximum field ($H_{\max}$)

the test field at which saturation characteristics of magnetic stripes are specified in EN 753-2. Different values of $H_{\max}$ are used in accordance with the class of magnetics [EN 753-2:1997]

3.18

maximum test current ($I_{\max}$)

the upper of two test write currents used for testing TFC magnetic stripes [EN 753-2:1997]

3.19

maximum test density ($D_{\max}$)

the upper of two test recording densities used for testing TFC magnetic stripes [EN 753-2:1997]

3.20

minimum test current ($I_{\min}$)

the lower of the two test write currents used for testing TFC magnetic stripes [EN 753-2:1997]

3.21

minimum test density ($D_{\min}$)

the lower of two test recording densities used for testing TFC magnetic stripes [EN 753-2:1997]

3.22

modulation

the range of variation of a readback signal. EN 753-2 controls modulation via the quantities U_{i2} and U_{A3} .

$$\text{modulation} = \frac{U_{i2(\max)} - U_{i2(\min)}}{2 U_{A3}} \quad [\text{EN 753-2:1997}]$$

3.23

overwrite; overwriting

a measure of the degree to which a signal is attenuated by the encoding of a new signal on the same track [EN 753-2:1997]

3.24

print contrast signal (PCS)

the ratio : print contrast divided by the reflectance of the paper on which the character is printed [ISO 18341]

3.25

recording area

any area used to store data on the card, such as a magnetic stripe, etc.

3.26

reference edges

datum edges for dimensioning and orientation, having a fixed relationship to the front of the card [EN 753-1:1997]

3.27

reference flux (F_R)

the flux in the test write head when the write current is I_R [EN 753-2:1997]

3.28

reference signal amplitude (U_R)

the primary standard readback signal amplitude. It is the maximum value of the average signal amplitude of the reference card, corrected to the primary standard [EN 753-2:1997]. The reference signal amplitude is used to calibrate the readback signal amplitude scale for the measurements required by EN 753-2 and EN 753-3

3.29

reference write current (I_R)

the primary standard write current, obtained from the secondary reference card by measurement [EN 753-2:1997]
The reference write current is used to calibrate the write current scale for the measurements required by EN 753-2 and EN 753-3

3.30

resistance to erasure

a measure of the strength of magnetic field required to erase the signal from a magnetic stripe. EN 753-2 controls resistance to erasure via the quantities U_{A5} and U_{i5} [EN 753-2:1997]

3.31

resolution

the ability of a magnetic stripe to support high density (short wavelength) recording. EN 753-2 controls resolution via the quantity U_{A3} [EN 753-2:1997]

3.32

special magnetics

magnetic characteristics which conform to those given in EN 753-2 for class S magnetics ; a reduced signal level form of class L [EN 753-2:1997]

3.33

sqareness (SQ)

the ratio of the value of magnetization (M) at zero magnetic field ($H = 0$) to that at $H_{\max}$ [EN 753-2:1997]

3.34

substrate

material of which the TFC is made without any recording media

3.35

switching field distribution (SFD)

the width, at half height, of the differentiated saturation $M = f(H)$ characteristic, divided by the field value midway between the two half-height points [EN 753-2:1997]

3.36

test piece

part of the sample or test sample on which the test is conducted

3.37

track

the area of stripe surface occupied by the data encoded by a single channel of the magnetic recording write/read interface [EN 753-2:1997]

3.38

uncertainty of measurement

an estimate characterizing the range of values within which the true value of a measurement lies [International vocabulary of basic and general terms in metrology]

3.39

upper density (UD)

the range of encoding densities given in EN 753-2 for class p encoding (> 3 bits/mm) [EN 753-2:1997]

3.40

usage (class of TFC)

the number of transaction cycles which the particular class of TFC is required to withstand in normal operation [EN 753-1:1997]

3.41

very high coercivity

coercivity values above 400 kA/m; magnetic stripes whose magnetic characteristics conform to those given in EN 753-2 for class V magnetics [EN 753-2:1997]

3.42

width

the dimension parallel to the longest edge of the card [EN 753-1:1997]

4 Symbols and abbreviations

$D_{\max}$	maximum test density
$D_{\min}$	minimum test density
F_R	reference flux
H_{cM}	coercivity
$H_{\max}$	maximum field
$I_{\max}$	maximum test current
$I_{\min}$	minimum test current
I_R	reference write current
R_a, R_z	measures of surface irregularity [see ISO 4287]
U_A	average signal amplitude
U_i	individual signal amplitude
U_R	reference signal amplitude
HiCo	high coercivity
LD	lower density
LoCo	low coercivity
SFD	switching field distribution
SQ	squareness
TFC	thin flexible card
UD	upper density