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**Identification cards — Test methods —**

**Part 2:**

**Cards with magnetic stripes**

*Cartes d'identification — Méthodes d'essai —*

*Partie 2: Cartes à bande magnétique*

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Contents

1 Scope ..... 1

2 Normative references ..... 1

3 Terms and definitions ..... 2

4 Default items applicable to the test methods ..... 4

4.1 Test environment..... 4

4.2 Pre-conditioning ..... 4

4.3 Selection of test methods ..... 4

4.4 Default tolerance..... 5

4.5 Total measurement uncertainty ..... 5

5 Test methods..... 5

5.1 Magnetic stripe area warpage..... 5

5.1.1 Apparatus ..... 5

5.1.2 Procedure ..... 6

5.1.3 Test report ..... 7

5.2 Height and surface profile of the magnetic stripe..... 7

5.2.1 Apparatus ..... 7

5.2.2 Procedure ..... 8

5.2.3 Expression of results ..... 9

5.2.4 Test report ..... 11

5.3 Surface roughness of the magnetic stripe..... 11

5.3.1 Procedure ..... 12

5.3.2 Test report ..... 12

5.4 Wear test for magnetic stripe ..... 12

5.4.1 Apparatus ..... 12

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5.4.2 Procedure .....	12
5.4.3 Test report .....	13
5.5 Amplitude measurements.....	13
5.5.1 Calibration reference.....	14
5.5.2 Apparatus .....	14
5.5.3 Procedure .....	18
5.5.4 Test report .....	20
5.6 Flux transition spacing variation .....	20
5.6.1 Apparatus .....	21
5.6.2 Procedure .....	21
5.6.3 Test report .....	21
5.7 Magnetic stripe adhesion.....	21
5.7.1 Apparatus .....	21
5.7.2 Procedure .....	22
5.7.3 Test report .....	22
5.8 Static magnetic characteristics.....	22
5.8.1 Apparatus .....	22
5.8.2 Procedure .....	23
5.8.3 Report .....	27

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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.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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.

International Standard ISO/IEC 10373-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Identification cards and related devices*.

ISO/IEC 10373 consists of the following parts, under the general title *Identification cards — Test methods*:

- Part 1: General characteristics tests
- Part 2: Cards with magnetic stripes
- Part 3: Integrated circuit(s) cards
- Part 5: Optical memory cards

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# Identification cards — Test methods —

## Part 2: Cards with magnetic stripes

### 1 Scope

ISO/IEC 10373 defines test methods for characteristics of identification cards according to the definition given in ISO/IEC 7810. Each test method is cross-referenced to one or more base standards, which may be ISO/IEC 7810 or one or more of the supplementary standards that define the information storage technologies employed in identification cards applications.

NOTE 1 - Criteria for acceptability do not form part of ISO/IEC 10373 but will be found in the International Standards mentioned above.

NOTE 2 - Test methods described in ISO/IEC 10373 are intended to be performed separately. A given card is not required to pass through all the tests sequentially.

This part of ISO/IEC 10373 defines test methods which are specific to magnetic stripe technology. ISO/IEC 10373-1, General characteristics, defines test methods which are common to one or more card technologies and other parts deal with other technology-specific tests.

### 2 Normative references

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The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 10373. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 10373 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1302:1992, *Technical drawings - Method of indicating surface texture*.

ISO 2409:1992, *Paints and varnishes - Cross-cut test*.

ISO 3274:1996, *Geometric Product Specification (GPS) - Surface texture: Profile method - Nominal characteristics of contact (stylus) instruments*.

ISO 4288:1996, *Geometric Product Specification (GPS) - Surface texture: Profile method - Rules and procedures for the assessment of surface texture*.

ISO/IEC 7810:1995, *Identification cards - Physical characteristics*.

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

ISO/IEC 7811-4:1995, *Identification cards - Recording technique - Part 4: Location of read-only magnetic tracks - Track 1 and 2*.

ISO/IEC 7811-5:1995, *Identification cards - Recording technique - Part 5: Location of read-write magnetic track - Track 3*.

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

### 3 Terms and definitions

For the purposes of this part of ISO/IEC 10373, the following terms and definitions apply.

#### 3.1 test method

method for testing characteristics of identification cards for the purpose of confirming their compliance with International Standards

#### 3.2 testably functional

has survived the action of some potentially destructive influence to the extent that:

- a) any magnetic stripe present on the card shows a relationship between signal amplitudes before and after exposure that is in accordance with the base standard
- b) any integrated circuit(s) present in the card continues to show an Answer to Reset response<sup>1</sup> which conforms to the base standard
- c) any contacts associated with any integrated circuit(s) present in the card continue to show electrical resistance and impedance which conform to the base standard
- d) any optical memory present in the card continue to show optical characteristics which conform to the base standard

#### 3.3 warpage

deviation from flatness

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#### 3.4 flux transitions per millimetre ft/mm

the linear recording density applied to a track on a magnetic stripe

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#### 3.5 recording

creating a track of flux reversals according to a test method given in this standard, with the values of all applicable test parameters specified

#### 3.6 encoding

creating a track of flux reversals whose spacing is modified, according to the F/2F coding scheme, to represent data

#### 3.7 surface roughness

surface topology of an area of surface, qualified in the international standards by reference to various resolution determinants and methods of calculation

#### 3.8 amplitude measurements (of a magnetic stripe)

measurement of readback signal amplitude, resolution, and erasure according to a test method given in this standard, with the values of all applicable test parameters specified

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<sup>1</sup> This part of ISO/IEC 10373 does not define any test to establish the complete functioning of integrated circuit(s) cards. The test methods require only that the minimum functionality (testably functional) be verified. This may, in appropriate circumstances, be supplemented by further, application specific functionality criteria which are not available in the general case.

**3.9****flux transition spacing variation**

deviation from nominal of measured values of the distance between adjacent flux transitions along a line parallel to the centre-line of the encoded track

**3.10****magnetic stripe adhesion**

strength of the bond between the magnetic stripe and the card

**3.11****normal use**

use as an Identification Card (see clause 4 of ISO/IEC 7810:1995), involving equipment processes appropriate to the card technology and storage as a personal document between equipment processes

**3.12****static saturation  $M(H)$  loop**

a normal hysteresis loop for which the magnetic field strength is cycled between the extremes  $-H_{\max}$  to  $+H_{\max}$  at such a low rate of change that the loop is not influenced by the rate of change (see IEC 50(221))

**3.13****coercivity**

$$H'_{cM} = H'_{cJ}$$

the continuously applied magnetic field which reduces the magnetisation to zero from a previously saturated state in the opposite direction (see IEC 50(221)). The quantity of interest is that which is measured parallel to the longitudinal axis of the stripe

**3.14****remanent coercivity****( $H_r$ )**

the applied magnetic field which when removed returns the material to a zero magnetisation state from a previously saturated state in the opposite direction. The quantity of interest is that which is measured parallel to the longitudinal axis of the stripe.

**3.15****oersted****Oe**

Gaussian cgs unit of magnetic field strength which is commonly used in the magnetic recording industry. Although there is no longer a normative relationship, one oersted may be taken to be equivalent to 79,578 A/m (see annex A (informative) of ISO 31-5:1992)

**3.16****static demagnetisation** **$S_{160}$** 

the reduction in magnetisation under the influence of an opposing magnetic field; characterised by  $(M_r - M^+(-160)) \div M_r$ ; the average slope of the "demagnetisation" quadrant of the static saturation  $M(H)$  loop between magnetic field strength values of  $H = 0$  and  $H = -160$  kA/m

**3.17****squareness** **$SQ$** 

$M_r/M(H_{\max})$  the ratio of the value of magnetisation ( $M$ ) at zero magnetic field strength ( $H = 0$ ) to that at  $H_{\max}$  obtained from the static saturation  $M(H)$  loop

**3.18****longitudinal squareness** **$SQ_{||}$** 

the squareness of the medium measured parallel to the longitudinal axis of the magnetic stripe

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### 3.19 perpendicular squareness $SQ_{\perp}$

the squareness of the medium measured perpendicular to the plane of the magnetic stripe

### 3.20 switching field distribution SFD

the difference between the field values at the intercept of the static saturation  $M(H)$  loop with  $M(H) = +0,5 M_r$  and  $M(H) = -0,5 M_r$ , divided by the coercivity, i.e.:

$$\text{SFD} = (|H_2| - |H_1|) \div H_{cM}$$

where

$$M(-|H_1|) = +0,5 M_r$$

$$M(-|H_2|) = -0,5 M_r$$

NOTE - Other definitions of SFD are commonly used that will give different results.

### 3.21 angle of maximum squareness $\theta(SQ_{\max})$

the angle between the direction at which the maximum value of squareness is found and the longitudinal axis of the magnetic stripe

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### 3.22 resolution

the average signal amplitude at 20 ft/mm (500 fpi) divided by the average signal amplitude at 8 ft/mm (200 fpi), multiplied by 100, expressed as a percentage

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## 4 Default items applicable to the test methods

### 4.1 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$  ( $73^{\circ}\text{F} \pm 5^{\circ}\text{F}$ ) and of relative humidity 40% to 60%.

### 4.2 Pre-conditioning

Where pre-conditioning is required by the test method, the identification cards to be tested shall be conditioned to the test environment for a period of 24 h before testing.

### 4.3 Selection of test methods

Unless otherwise specified, tests shall be applied according to the attributes of the card to be tested, as shown in table 1.



Table 1 — Selection of tests according to features present

Test method	Card has Mag stripe	Mag stripe is encoded
5.1 Card warpage - mag stripe area	✓	
5.2 Height and surface profile of the magnetic stripe	✓	
5.3 Surface roughness of the magnetic stripe	✓	
5.4 Wear test for magnetic stripe	✓	
5.5 Amplitude measurements	✓	✓
5.6 Flux transition spacing variation		✓
5.7 Magnetic stripe adhesion	✓	
5.8 Static magnetic characteristics <sup>a</sup>	✓	

<sup>a</sup> Static magnetic characteristics are an informative part of the base standard. Consequently, the associated tests are not mandatory.

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#### 4.4 Default tolerance

Unless otherwise specified, a default tolerance of  $\pm 5\%$  shall be applied to the quantity values given to specify the characteristics of the test equipment (e.g. linear dimensions) and the test method procedures (e.g. test equipment adjustments).

#### 4.5 Total measurement uncertainty

The total measurement uncertainty for each quantity determined by these test methods shall be stated in the test report.

### 5 Test methods

#### 5.1 Magnetic stripe area warpage

The purpose of this test is to measure the degree of warpage of a card test sample in the area of the magnetic stripe (see ISO/IEC 7810:1995).

The method is applicable to both embossed and unembossed cards.

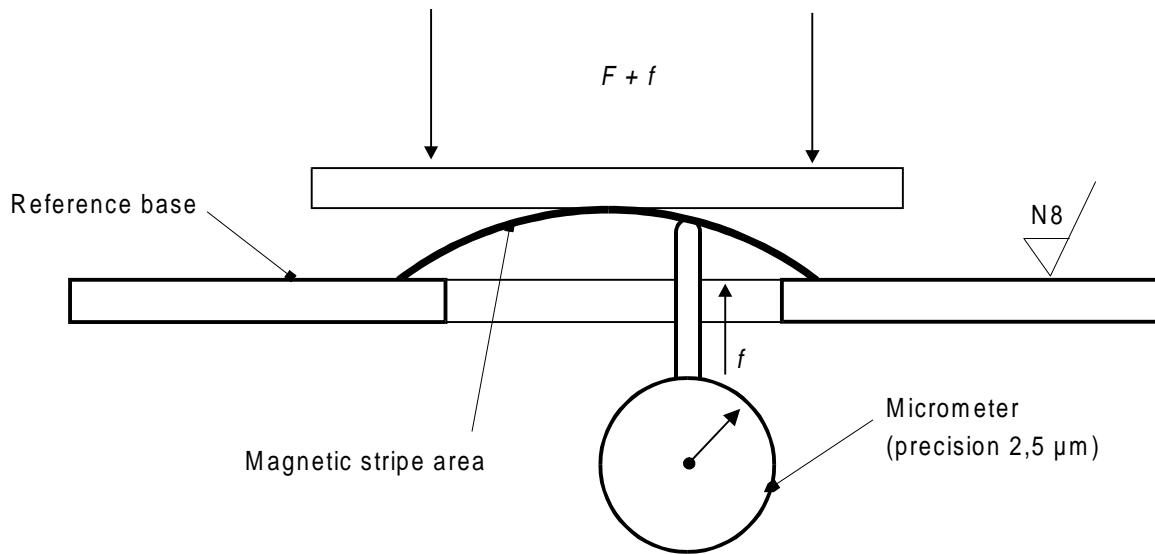
##### 5.1.1 Apparatus

The apparatus is shown in figure 1. It comprises:

- a level rigid plate whose surface roughness is not greater than  $3,2\ \mu\text{m}$  ( $130\ \mu\text{in}$ ) in accordance with ISO 1302:1992. The plate shall contain an aperture to allow access for a micrometer probe;
- a micrometer accurate to within  $2,5\ \mu\text{m}$  ( $98\ \mu\text{in}$ ) with a probe whose contact area is a hemisphere with a diameter in the range of 3 mm to 8 mm (0.1 in to 0.3 in). The force exerted by the probe shall be  $f = 0,6\ \text{N} \pm 0,3\ \text{N}$  ( $0.13\ \text{lbf} \pm 0.07\ \text{lbf}$ );

- c) a means of applying a force  $F = 2,2 \text{ N}$  (0.49 lbf) evenly distributed on the front face of the card opposite the magnetic stripe area.

not to scale



**Figure 1 — Measuring arrangement**  
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**5.1.2 Procedure**

Place the sample card, front side up, on the level rigid plate. Position the magnetic stripe area to be measured over the aperture.

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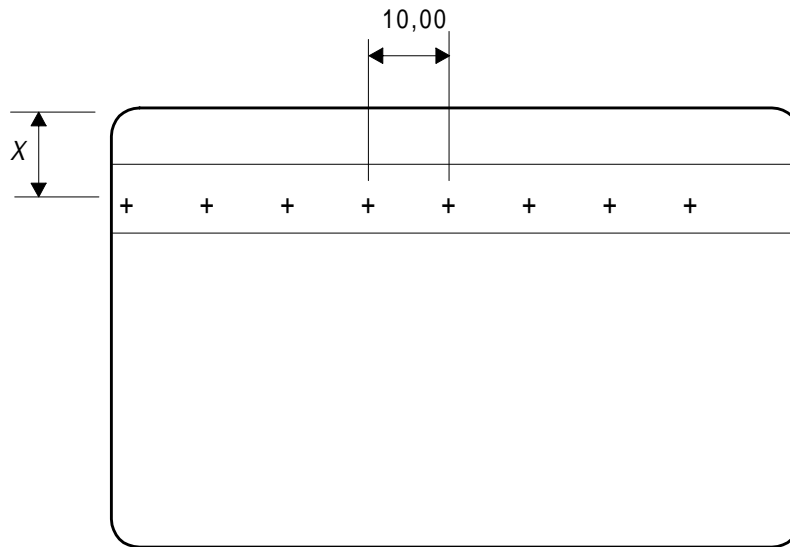
<https://standards.iteh.ai/catalog/standards/sist/3a5ea6a5-dad8-4c99-a83e-3633b52e6720-iso-iec-10373-2-1998>

The load of 2,2 N (0.49 lbf) should be increased by an amount  $f$  to compensate for the micrometer force which is acting in the opposite direction to that force.

Apply the force  $F (+ f)$  directly over the magnetic stripe area on the front side of the card. Wait 1 minute before making any measurements.

Measure the card stripe area warpage at the nine positions along the stripe as shown in figure 2.

dimensions in mm  
not to scale



NOTE - the value of  $X$  is given in table 2.

Figure 2 — Measuring points on the card  
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Table 2 — Position of the line of measuring points

Magnetic stripe area	Dimension $X$ (mm)
Tracks 1 and 2	8,00
Tracks 1, 2 and 3	10,70

### 5.1.3 Test report

The test report shall give the maximum value obtained from the set of nine measurements.

### 5.2 Height and surface profile of the magnetic stripe

The purpose of this test is to determine the height and flatness of the magnetic stripe of a card test sample (see ISO/IEC 7811-2:1995 and ISO/IEC 7811-6:1996).

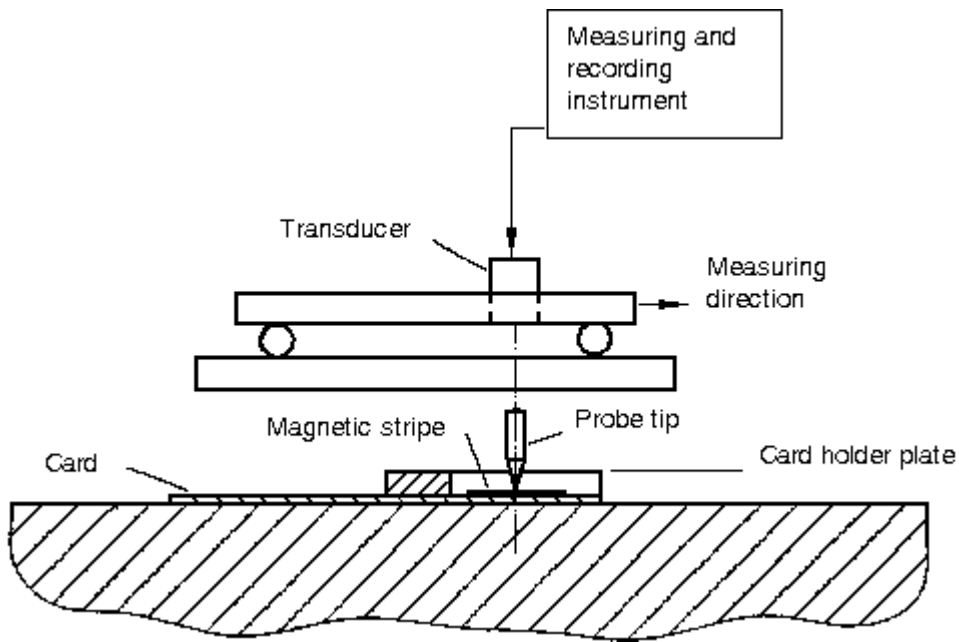
The location of the stripe is described in ISO/IEC 7811-4:1995 and ISO/IEC 7811-5:1995. The height of the magnetic stripe is determined by reference to the card and the stripe surface profile.

#### 5.2.1 Apparatus

The following items are required:

- a profilometer (see figure 3);
- a notched rigid metal plate as shown in figure 4. Any rigid metal can be used to construct the plate, but its thickness shall be adjusted, according to the density of the material, to achieve a weight of  $2,2 \text{ N} \pm 0,1 \text{ N}$  ( $0.49 \text{ lbf} \pm 0.02 \text{ lbf}$ ). All dimensions of the plate shall be  $\pm 0,5 \text{ mm}$  ( $0.02 \text{ in}$ ) or better.

not to scale



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Figure 3 — Measuring device for the height and the profile of the magnetic stripe  
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not to scale  
dimensions in millimetres

