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**Identification cards — Test methods —  
Part 2:  
Cards with magnetic stripes**

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

*Partie 2: Cartes à bandeaux magnétiques*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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.

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 10373-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

This second edition cancels and replaces the first edition (ISO/IEC 10373-2:1998), which has been technically revised.

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

- *Part 1: General characteristics*
- *Part 2: Cards with magnetic stripes*
- *Part 3: Integrated circuit(s) cards with contacts and related interface devices*
- *Part 5: Optical memory cards*
- *Part 6: Proximity cards*
- *Part 7: Vicinity cards*

# 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 card applications.

This part of ISO/IEC 10373 defines test methods which are specific to magnetic stripe technology.

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

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

### 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 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

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

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

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO/IEC 7811-2, *Identification cards — Recording technique — Part 2: Magnetic stripe — Low coercivity*

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

ISO/IEC 7811-7, *Identification cards — Recording technique — Part 7: Magnetic stripe — High coercivity, high density*

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

### 3 Terms and definitions

For the purposes of this document, 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 continue 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 continues to show optical characteristics which conform to the base standard;
- e) any contactless integrated circuit(s) in the card continue to operate as intended.

#### 3.3 warpage

deviation from flatness

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

linear recording density applied to a track on a magnetic stripe

#### 3.5 recording

creating a track of flux reversals according to a test method given in this part of ISO/IEC 10373, with the values of all applicable test parameters specified

#### 3.6 encoding

creating a track of flux reversals whose spacing is modified, according to a 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

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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.

**3.8****amplitude measurements**

⟨magnetic stripe⟩ measurement of readback signal amplitude according to a test method given in this part of ISO/IEC 10373, with the values of all applicable test parameters specified

**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 7810:2003), involving equipment processes appropriate to the card technology and storage as a personal document between equipment processes

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

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**

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

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

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**3.14****remanent coercivity**

$$H_r$$

applied magnetic field which when removed returns the material to a zero magnetisation state from a previously saturated state in the opposite direction, measured parallel to the longitudinal axis of the stripe

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**3.15****oersted**

$$Oe$$

Gaussian CGS unit of magnetic field strength which is commonly used in the magnetic recording industry, equal to approximately 79,578 A/m (relationship is informative, see annex A (informative) of ISO 31-5:1992)

**3.16****static demagnetisation**

$$S_{160}$$

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**

$$SQ$$

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

NOTE  $SQ = M_r/M(H_{\max})$ .

**3.18**

**longitudinal squareness**

$SQ_{||}$

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

**3.19**

**perpendicular squareness**

$SQ_{\perp}$

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

**3.20**

**switching field by derivative**

$SF_D$

width at half height of the differentiated static magnetisation curve  $M(H)$  divided by the coercivity from the same curve

**3.21**

**switching field by slope**

$SF_S$

difference between the field values at the intercept of the static magnetisation  $M(H)$  loop with  $M(H) = 0,5M_r$  and  $M(H) = -0,5M_r$ , divided by the coercivity

NOTE  $SF_S = (|H_2| - |H_1|) / H_{cM}$ , where  $M(-H_1) = 0,5M_r$  and  $M(-H_2) = -0,5M_r$ .

**3.22**

**angle of maximum squareness**

$\theta(SQ_{max})$

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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**3.23**

**resolution**

average signal amplitude at some specified higher recording density divided by the average signal amplitude at some specified lower recording density, multiplied by 100, expressed as a percentage

**3.24**

$U_F$

magnitude of the individual element at specified frequency of the Fourier spectrum of the entire waveform of the stripe

**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**

Tests shall be applied as required to test the attributes of the card defined by the relevant base standard.



#### 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 7811-2, ISO/IEC 7811-6 and ISO/IEC 7811-7).

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. The plate shall contain an aperture to allow access for a micrometer probe;
- a dial indicator 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  $3 \text{ mm}$  to  $8 \text{ mm}$  ( $0,1 \text{ in.}$  to  $0,3 \text{ in.}$ ). The force exerted by the probe shall be  $f = 0,6 \text{ N} \pm 0,3 \text{ N}$  ( $0,13 \text{ lbf} \pm 0,07 \text{ lbf}$ );
- a means of applying a force  $F = 2,2 \text{ N}$  ( $0,49 \text{ lbf}$ ) evenly distributed on the front face of the card opposite the magnetic stripe area.

not to scale

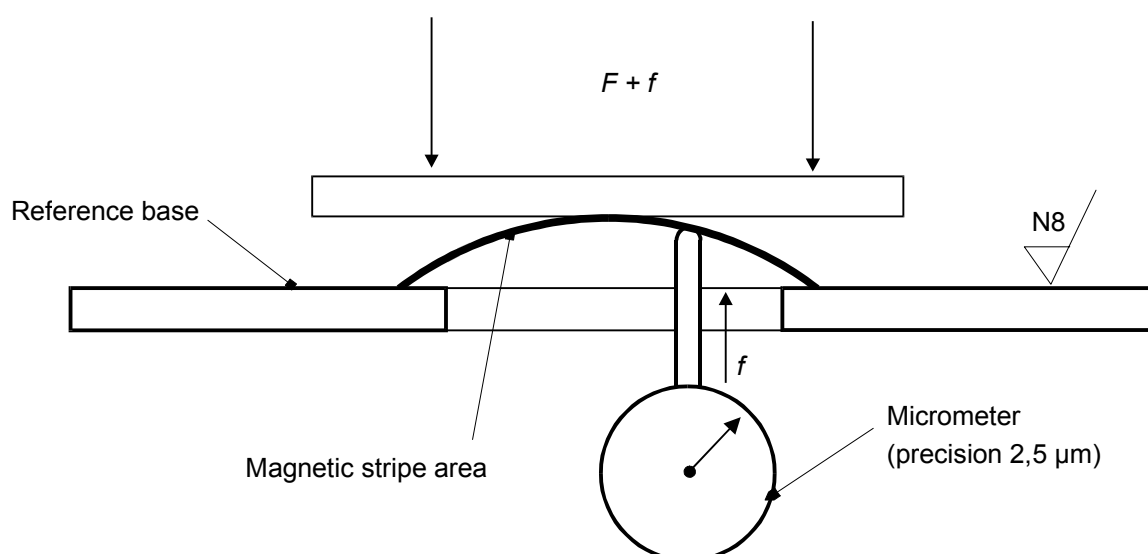


Figure 1 — Measuring arrangement

5.1.2 Procedure

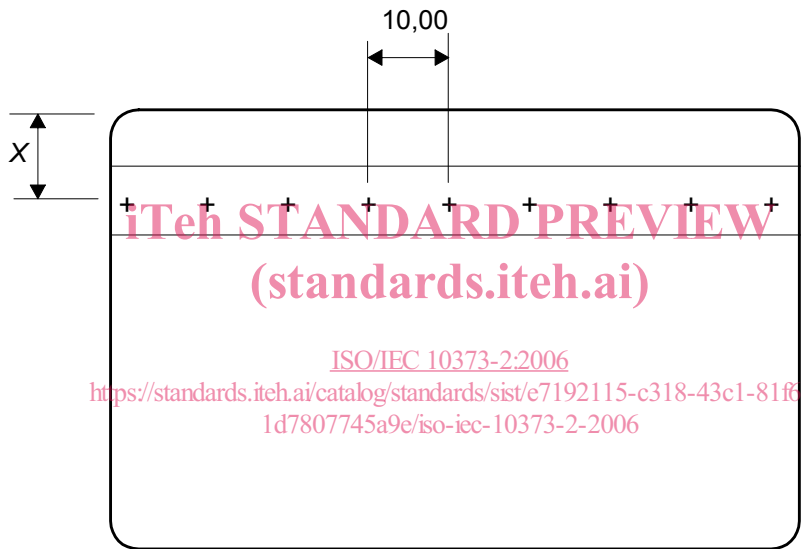
Place the sample card, front side up, on the level rigid plate. Position the magnetic stripe area to be measured over the aperture.

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. Additional locations shall be measured if the magnetic stripe area warpage appears greater in those areas than in the nine designated areas.

dimensions in mm  
not to scale



NOTE - the value of  $X$  is given in Table 1.

Figure 2 — Measuring points on the card

Table 1 — 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, ISO/IEC 7811-6 and ISO/IEC 7811-7).

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) a profilometer (see Figure 3);
- b) 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

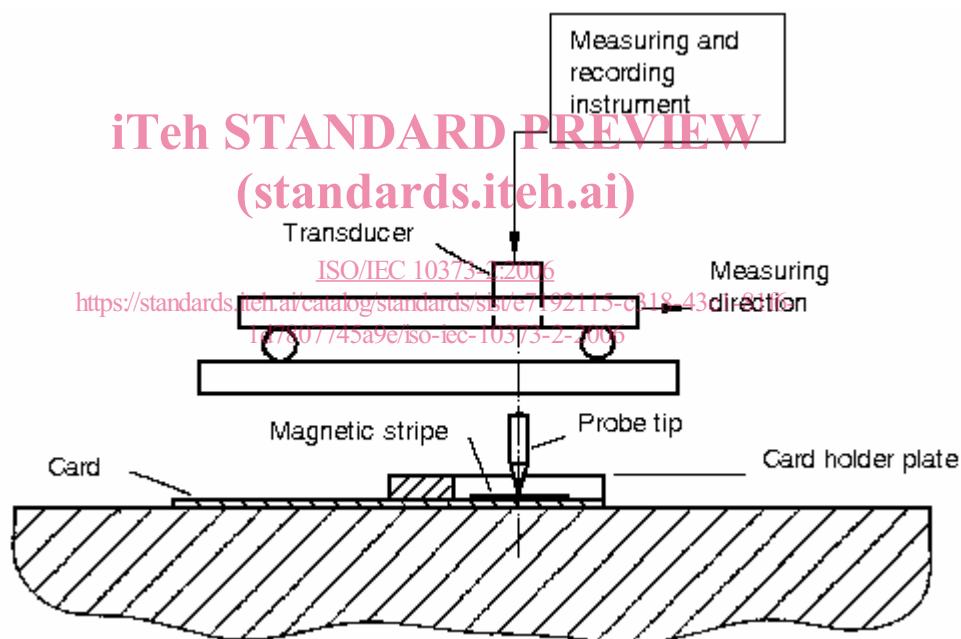


Figure 3 — Measuring device for the height and the profile of the magnetic stripe

not to scale  
 dimensions in millimetres

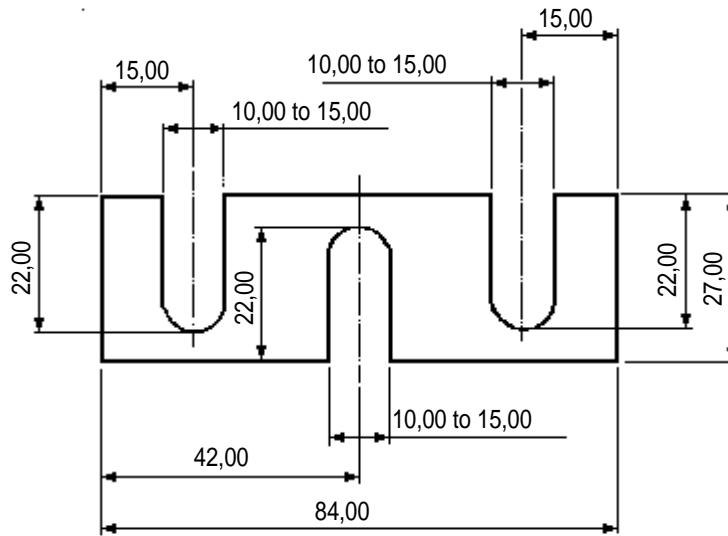


Figure 4 — Card holder plate (contact area)

5.2.2 Procedure

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Hold the card to be tested under the notched rigid metal plate shown in Figure 4.

Measure the height and the surface profile of the magnetic stripe and the surrounding card surface using a measuring recording instrument.

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Measure the profile at a maximum speed of 1 mm/s (0.04 in/s) using a probe having a radius of 0,38 mm to 2,54 mm (0.015 in to 0.1 in) applied with a force of 0,5 mN to 6 mN (0.0001 lbf to 0.0013 lbf).

Take three measurements on each specimen across the width of the stripe. The three locations V, X and Y are defined as the distance of 15 mm ± 2 mm (0.59 in ± 0.08 in) from each end of the card and location X the centreline of the card (see Figure 5).

Additional areas shall be measured if the height or surface profile deviations appear to be greater in those areas than in the three designated areas.

The starting point for measurement along each line V,X,Y begins 1 mm min (0.04 in min) above the top edge of the magnetic media and ends 1 mm min (0.04 in min) below the bottom edge of the magnetic media.

NOTE – In preparing the test card for the surface profile measurement, it is helpful to lightly scribe a line, using a sharp knife, parallel to the top reference edge of the card for locating the minimum stripe width *W* on the profile recording.