INTERNATIONAL STANDARD

ISO/IEC 7811-7

First edition
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Identification cards — Recording technique —

Part 7: Magnetic stripe — High coercivity, high density

Cartes d'identification — Technique d'enregistrement —
Partie 7: Bandeau magnétique — Haute coercitivité, haute densité

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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 7811-7 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

ISO/IEC 7811 consists of the following parts, under the general title *Identification cards — Recording technique:*

— *Part 1: Embossing*

— *Part 2: Magnetic stripe — Low coercivity*

— *Part 6: Magnetic stripe — High coercivity*

— *Part 7: Magnetic stripe — High coercivity, high density*

Introduction

This edition is new and was prepared by JTC 1/SC 17/WG1 *Physical characteristics and test methods for ID cards*. Portions of this International Standard are identical to ISO/IEC 7811-2 and ISO/IEC 7811-6, however the user is encouraged to review the entire International Standard. The major differences between this International Standard and ISO/IEC 7811-2 and ISO/IEC 7811-6 are listed below.

1. The bit density has increased from 8,27 bits/mm (track 1,3) and 2,95 bits/mm (track 2) to 40 bits/mm for all tracks which results in 234 bytes of user data per track for an ID-1 size card.
2. The encoding technique referred to as MFM is used in place of F2F. This change doubles the data storage density for the same minimum transition spacing with only a small reduction in the self-clocking ability.
3. The 3 tracks have been replaced by 6 tracks that are approximately half the width so that they occupy the same space on the card. These are located so that readers designed to read the high density tracks will also be able to read cards conforming to ISO/IEC 7811-2 and ISO/IEC 7811-6.
4. Data is distributed in frames with synchronisation characters to aid in error recovery, and there is a CRC for each frame and a track CRC. Data recorded on each track is independent from other tracks (error detection and correction for each track is on the same track), even though it may be only part of the message on the card.
5. Error detection and correction is included using a shortened Reed-Solomon code. The amount of error correction is fixed for all card sizes.
6. The magnetic stripe area extends completely to the left and right edge of the card.
7. In Table 1, test density values have changed, the resolution requirement has changed from 0,7 to 0,8, the test for Waveform has been deleted, and Overwrite has been added to the requirements.
8. The maximum coercivity in Table D.1 of informative Annex D has been changed from 335 kA/m (4200 Oe) to 250 kA/m (3125 Oe).

Notes in this International Standard are only used for giving additional information intended to assist in the understanding or use of the standard and do not contain provisions or requirements to which it is necessary to conform in order to be able to claim compliance with this standard.

Identification cards — Recording technique —

Part 7: Magnetic stripe — High coercivity, high density

1 Scope

This part of ISO/IEC 7811 is one of a series of standards describing the characteristics for identification cards as defined in the definitions clause and the use of such cards for international interchange.

This part of ISO/IEC 7811 specifies requirements for a high coercivity magnetic stripe (including any protective overlay) on an identification card, the encoding technique and coded character sets. It takes into consideration both human and machine aspects and states minimum requirements.

Coercivity influences many of the quantities specified in this part of ISO/IEC 7811 but is not itself specified. The main characteristic of the high coercivity magnetic stripe is its improved resistance to erasure. This is achieved with minimal probability of damage to other magnetic stripes by contact while retaining read compatibility with magnetic stripes as defined in ISO/IEC 7811-2.

This standard provides for a card capacity of approximately 10 times that of a card conforming to ISO/IEC 7811-6. The number of tracks has been increased to 6, each track being approximately half the width of tracks conforming to ISO/IEC 7811-6, located so that readers designed to read these high density tracks will also be able to read cards conforming to ISO/IEC 7811-2 and ISO/IEC 7811-6. Data is encoded in 8 bit bytes using the MFM encoding technique. Data framing is used to limit error propagation and error correction techniques further improve reliability of reading.

It is the purpose of this series of standards to provide criteria to which cards shall perform. No consideration is given within these standards to the amount of use, if any, experienced by the card prior to test. Failure to conform to specified criteria should be negotiated between the involved parties.

ISO/IEC 10373-2 specifies the test procedures used to check cards against the parameters specified in this part of ISO/IEC 7811.

NOTE Numeric values in the SI and/or Imperial measurement system in this part of ISO/IEC 7811 may have been rounded off and therefore are consistent with, but not exactly equal to, each other. Either system may be used, but the two should not be intermixed or reconverted. The original design was made using the Imperial measurement system.

2 Conformance

A prerequisite for conformance with this part of ISO/IEC 7811 is conformance with ISO/IEC 7810. An identification card is in conformance with this part of ISO/IEC 7811 if it meets all mandatory requirements specified herein. Default values apply if no others are specified.

3 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 4287-1, *Surface roughness — Terminology — Part 1: Surface and its parameters*

ISO/IEC 7810, *Identification cards — Physical characteristics*

ISO/IEC 10373-1, *Identification cards — Test methods — Part 1: General characteristics tests*

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

4 Terms and definitions

For the purposes of this part of ISO/IEC 7811, the terms and definitions given in ISO/IEC 7810 and the following apply.

4.1
primary standard
set of reference cards established and maintained by Physikalisch-Technische Bundesanstalt (PTB) that represent the values of U_R and I_R designated RM7811-7

4.2
secondary standard
reference card designated RM7811-7 that is related to the primary standard as stated in the calibration certificate supplied with each card

NOTE Secondary standards can be ordered from Physikalisch-Technische Bundesanstalt (PTB), AG. 2.52 - Bundesallee 100, D-38116 Braunschweig, Germany. The source of secondary standards will be maintained at least until 2005.

4.3
unused un-encoded card
card possessing all the components required for its intended purpose, which has not been subjected to any personalization or testing operation, and which has been stored in a clean environment with no more than 48 hour exposure to day-light at temperatures between 5 °C to 30 °C and humidity between 10 % to 90 % without experiencing thermal shock

4.4
unused encoded card
card according to 4.3 that has only been encoded with all the data required for its intended purpose (e.g. magnetic encoding, embossing, electronic encoding)

4.5
returned card
card according to 4.4 after it has been issued to the card holder and returned for the purpose of testing

4.6
flux transition
location of the greatest rate of change with distance of the magnetization

4.7
reference current
***I*R**
minimum recorded current amplitude under the given test conditions that causes, on the reference card, a readback signal amplitude equal to 80 % of the reference signal amplitude U_R, at a density of 20 flux transitions per millimetre (508 flux transitions per inch) as shown in Figure 6

4.8
reference flux level
***F*R**
flux level in the test head that corresponds to the reference current I_R

4.9
test recording currents
two recording currents defined by:

I_{min} = Recording current corresponding to 2,2 F_R
I_{max} = Recording current corresponding to 2,5 F_R

4.10
individual signal amplitude
***U*i**
base-to-peak amplitude of a single readback voltage signal

4.11
average signal amplitude
***U*A**
sum of the absolute values of the amplitude of each signal peak (U_i) divided by the number of signal peaks (n) for a given track over the length of the magnetic stripe area

4.12
reference signal amplitude
***U*R**
maximum value of the average signal amplitude of a reference card corrected to the primary standard

4.13
physical recording density
number of flux transitions per unit length recorded on a track

4.14
bit density
number of data bits stored per unit of length (bits/mm or bpi)

4.15
bit cell
distance for a data bit nominally the reciprocal of the bit density (see Figure 8)

4.16
average bit cell
***B*a**
product of bit cell length and sum of the actual distances for all flux transition intervals on a track divided by the sum of the nominal distances for all flux transition intervals on the track

4.17
local average bit cell

B_{a6}
comparison reference for a given flux transition interval equal to the nominal L1 distance multiplied by the sum of the actual distances for the previous six flux transition intervals divided by the sum of the nominal distances for the previous six flux transition intervals (L1 * (Σ actual)/(Σ nominal))

4.18
demagnetization current

I_d
D C current value that reduces the average signal amplitude to 80 % of the reference signal amplitude (U_R) on a secondary reference card that has been encoded at a density of 40 ft/mm (1016 ftpi) at a current of I_{min}

4.19

L_1
short distance between adjacent flux transitions nominally equal to 1 times the bit cell

4.20

L_2
medium distance between adjacent flux transitions nominally equal to 1,5 times the bit cell

4.21

L_3
long distance between adjacent flux transitions nominally equal to 2 times the bit cell

4.22
FSC
frame synchronization character

4.23
CRC
cyclic redundancy check

4.24
CP
column parity

4.25

U_F
magnitude of the individual element at 20 flux transitions per mm frequency of the Fourier spectrum for a given track over the length of the magnetic stripe area

5 Physical characteristics of the identification card

The identification card shall conform to the specification given in ISO/IEC 7810.

WARNING — The attention of card issuers is drawn to the fact that information held on the magnetic stripe may be rendered ineffective through contamination by contact with dirt and certain commonly used chemicals including plasticizers. It should also be noted that any printing or screening placed on top of the magnetic stripe must not impair the function of the magnetic stripe.

5.1 Magnetic stripe area warpage

Application of a 2,2 N (0.5 lbf) load evenly distributed on the front face opposite the magnetic stripe shall bring the entire stripe within 0,08 mm (0.003 in) of the rigid plate.

5.2 Surface distortions

There shall be no surface distortions, irregularities or raised areas on both the front and the back of the card in the area shown in Figure 1 that might interfere with the contact between the magnetic head and magnetic stripe.

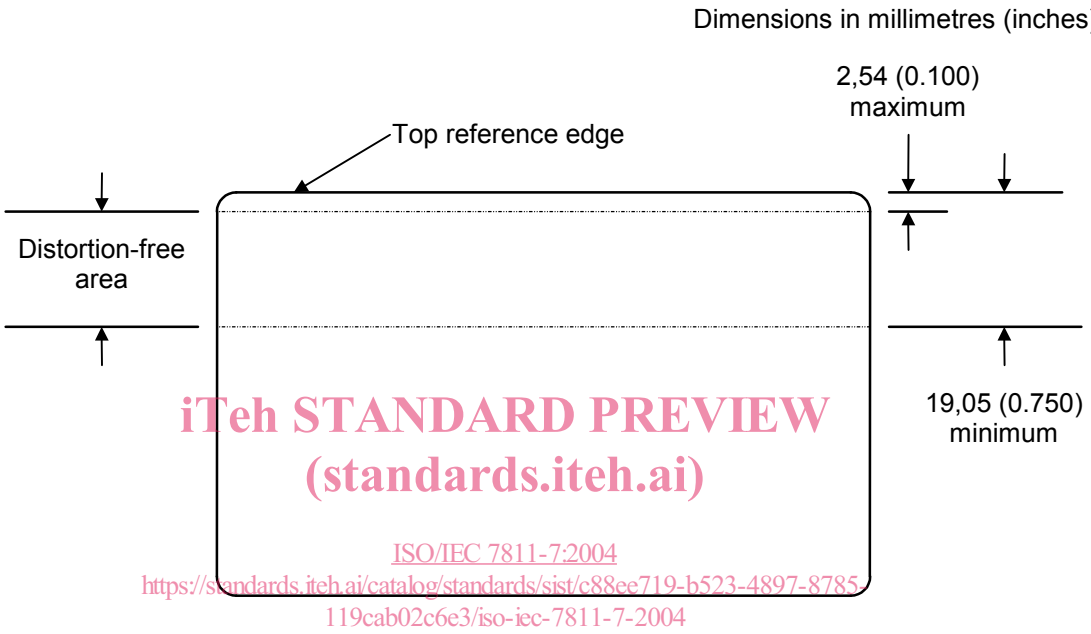


Figure 1 — Distortion-free area on card with magnetic stripe

If a raised signature panel area is located on the front or back of the card, then it shall be no closer to the top edge of the card than 19,05 mm (0.750 in).

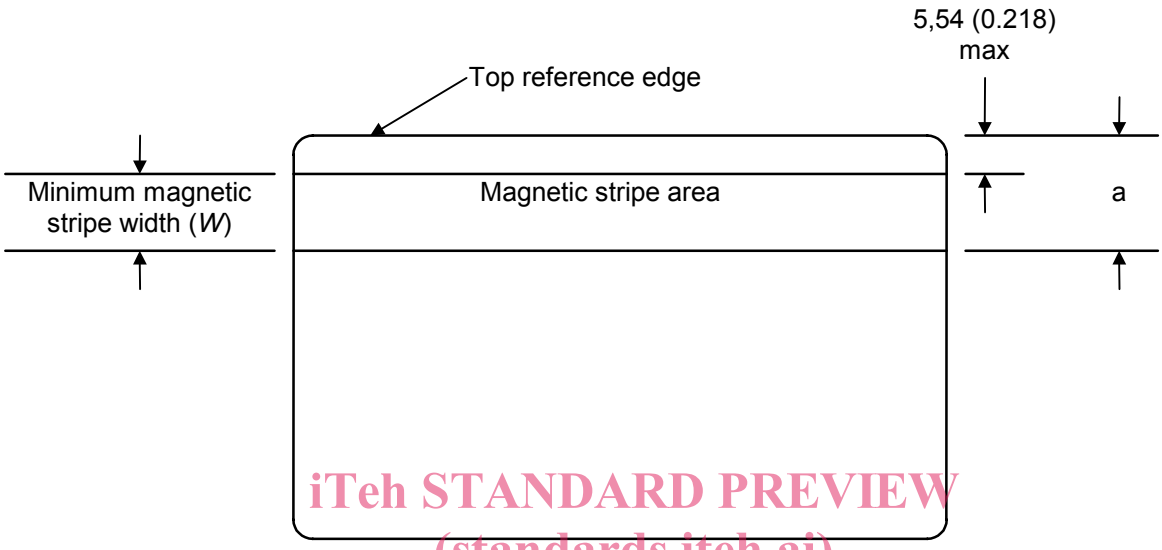
NOTE Raised areas and distortions on other areas of the card may cause card transport problems with magnetic stripe processing equipment resulting in reading or writing errors.

6 Physical characteristics of the magnetic stripe

6.1 Height and surface profile of the magnetic stripe area

The magnetic stripe area is located on the back of the card as shown in Figure 2.

Dimensions in millimetres (inches)



For use of tracks H1 to H3: a = 11,89 (0.468) min
For use of tracks H1 to H6: a = 15,95 (0.628) min

Figure 2 — Location of magnetic material

6.1.1 Surface profile of the magnetic stripe area

The maximum vertical deviation (*a*) of the transverse surface profile of the magnetic stripe area is shown below. See Figures 3, 4 and 5. The slope of the surface profile curve shall be limited to: -4a/W < slope < 4a/W.

When the bending stiffness value (see ISO/IEC 7810) for the card is 20 mm or more then the surface profile limits are:

Minimum stripe width	**As shown in Figure 3A**	**As shown in Figure 3B**
W = 6,35 mm (0.25 in)	a ≤ 9,5 μm (375 μin)	a ≤ 5,8 μm (225 μin)
W = 10,28 mm (0.405 in)	a ≤ 15,4 μm (607 μin)	a ≤ 9,3 μm (365 μin)

When the bending stiffness value (see ISO/IEC 7810) for the card is less than 20 mm then the surface profile limits are:

Minimum stripe width	**As shown in Figure 3A**	**As shown in Figure 3B**
W = 6,35 mm (0.25 in)	a ≤ 7,3 μm (288 μin)	a ≤ 4,5 μm (175 μin)
W = 10,28 mm (0.405 in)	a ≤ 11,7 μm (466 μin)	a ≤ 7,3 μm (284 μin)