INTERNATIONAL STANDARD

ISO/IEC 7811-8

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Identification cards — Recording technique —

Part 8: Magnetic stripe — Coercivity of 51,7 kA/m (650 Oe)

Cartes d'identification — Technique d'enregistrement —

Partie 8: Zone magnétique — Coercivité de 51,7 kA/m (650 Oe)

Reference number
ISO/IEC 7811-8:2008(E)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for world-wide 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.

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

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.

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*

— *Part 8: Magnetic stripe — Coercivity of 51,7 kA/m (650 Oe)*

ISO/IEC 7811-8 was prepared by JTC 1, *Information technology*, SC 17, *Cards and personal identification*. It is similar to ISO/IEC 7811-2 except that its higher coercivity requires higher energy to encode the data. The user of ISO/IEC 7811-8 is encouraged to review the entire standard for revisions and updates. The major differences from ISO/IEC 7811-2 are listed below.

a) In terms of coercivity, ISO/IEC 7811-8 media (51,7 kA/m, 650 Oe) is between ISO/IEC 7811-2 (23,9 kA/m, 300 Oe) and ISO/IEC 7811-6 (minimum 199 kA/m, 2500 Oe).

b) The primary application for 51,7 kA/m (650 Oe) is for hotel guest-room entry systems worldwide.

c) ISO/IEC 7811-8 specifies the “window” to be used to establish Table 1 values for 51,7 kA/m (650 Oe) media. The main difference being in the I_{min} (6,5 F_{R}) and I_{max} (8 F_{R}) values which define the extremities of the window.

d) Encoding techniques, specification and error detection are not specified in this part of ISO/IEC 7811.

e) Wherever possible, the same definitions, criteria and test methods are used in ISO/IEC 7811-2, ISO/IEC 7811-6, and ISO/IEC 7811-8.

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

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Identification cards — Recording technique —

Part 8:
Magnetic stripe — Coercivity of 51,7 kA/m (650 Oe)

1 Scope

ISO/IEC 7811 defines the characteristics for identification cards as defined in Clause 4 of this part of ISO/IEC 7811, and the use of such cards for international interchange.

This part of ISO/IEC 7811 specifies requirements for a 51,7 kA/m (650 Oe) magnetic stripe (including any protective overlay) on an identification card. The encoding technique and coded character sets are not defined, however, the specifications of ISO/IEC 7811-2 may be used. 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. It has a nominal value of 51,7 kA/m (650 Oe), but is not itself specified. Exposure of the card to a magnetic field is likely to destroy the recorded data.

ISO/IEC 7811 provides criteria to which cards are to perform. No consideration is given within ISO/IEC 7811 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, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

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

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

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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*

4 Terms and definitions

For the purposes of this document, 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 RM7811/2

4.2
secondary standard
reference card designated RM7811/2 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), AG2.52 - Bundesallee 100, D-38116 Braunschweig, Germany. The source of secondary standards will be maintained at least until 2010.

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 h exposure to daylight at temperatures between 5 °C and 30 °C and humidity between 10 % and 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 magnetisation

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 8 flux transitions per millimetre (200 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

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4.9
test recording currents
two recording currents specific to 51,7 kA/m (650 Oe) media defined by

I_{min} = recording current corresponding to 6,5 F_R
I_{max} = recording current corresponding to 8,0 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 value 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 between two clocking flux transitions

4.16
sub interval
distance that is nominally half of the distance between two clocking flux transitions

5 Physical characteristics of the identification card

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

NOTE Requirements in Clause 5 are identical to those in ISO/IEC 7811-2.

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.

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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.

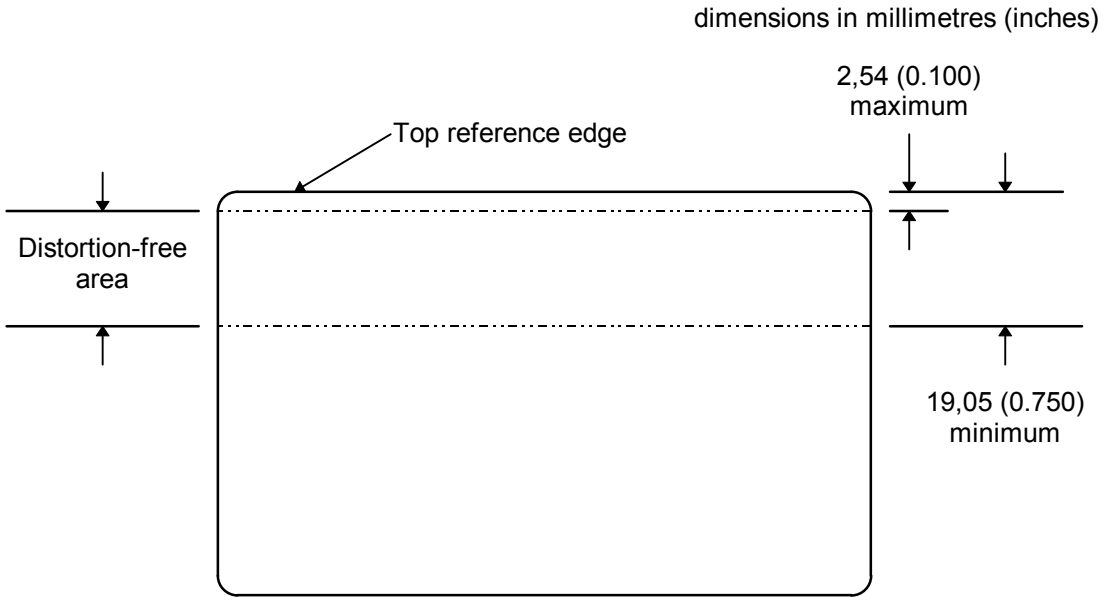


Figure 1 — Distortion-free area on card with magnetic stripe

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

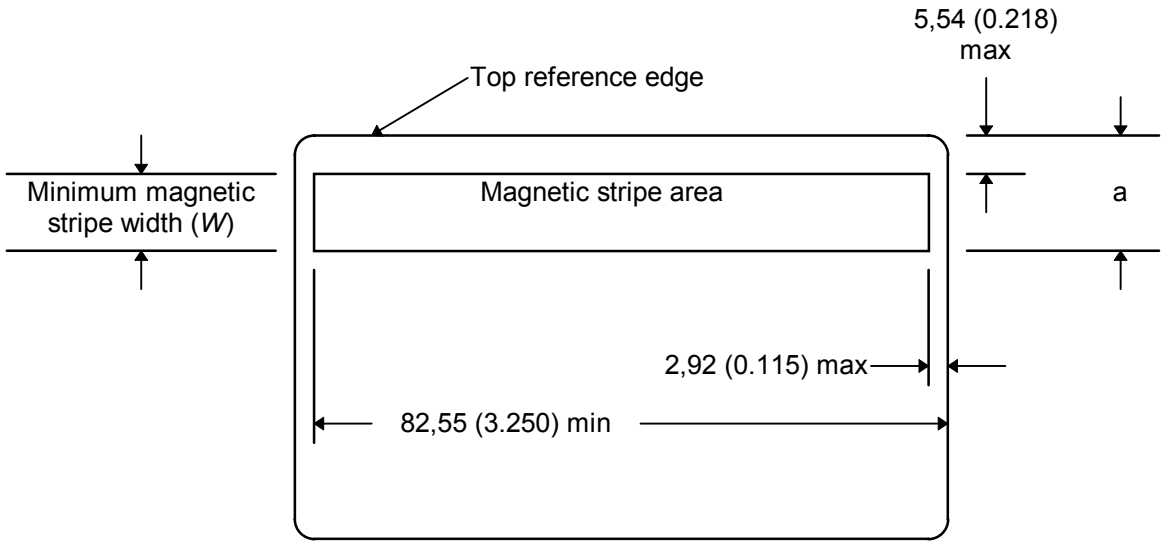
NOTE Requirements in Clause 6 are identical to those in ISO/IEC 7811-2.

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.

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dimensions in millimetres (inches)



For use of tracks 1 and 2: a = 11,89 (0.468) min
For use of tracks 1, 2, and 3: a = 15,95 (0.628) min

NOTE In the case of the magnetic stripe area used for tracks 1 and 2, the dimension a as shown in Figure 2 of the magnetic media could be less than the maximum dimension b as shown in Figure 11 for the location of track 2 data on the card. It is desirable that the magnetic stripe area extend beyond the limits of the encoded track.

Figure 2 — Location of magnetic material for ID-1 type card

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 as defined in 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 $\leqslant$ 9,5 μm (375 μin)	a $\leqslant$ 5,8 μm (225 μin)
W = 10,28 mm (0.405 in)	a $\leqslant$ 15,4 μm (607 μin)	a $\leqslant$ 9,3 μm (365 μin)

When the bending stiffness value as defined in 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 $\leqslant$ 7,3 μm (288 μin)	a $\leqslant$ 4,5 μm (175 μin)
W = 10,28 mm (0.405 in)	a $\leqslant$ 11,7 μm (466 μin)	a $\leqslant$ 7,3 μm (284 μin)

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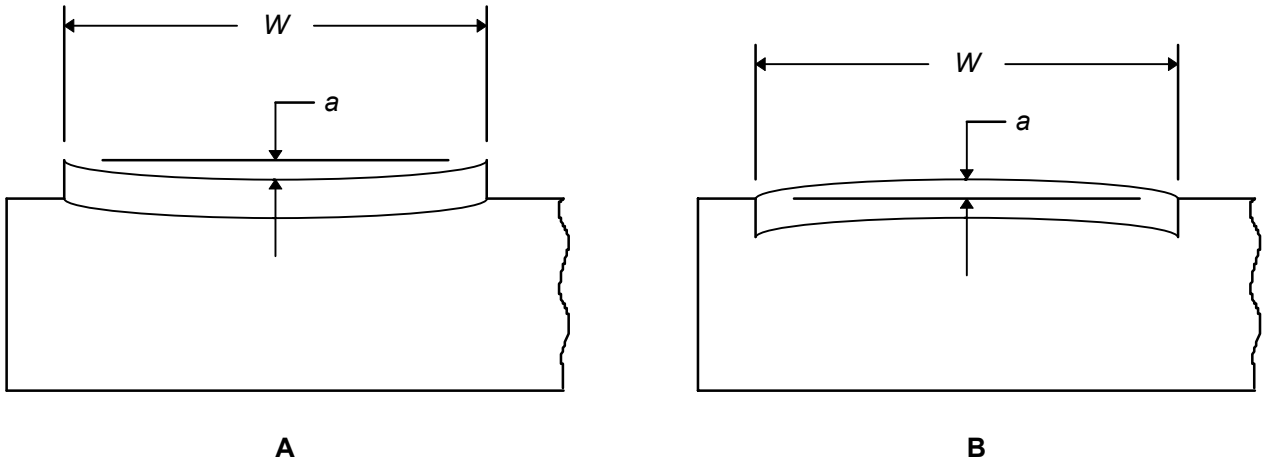


Figure 1 — Surface profile

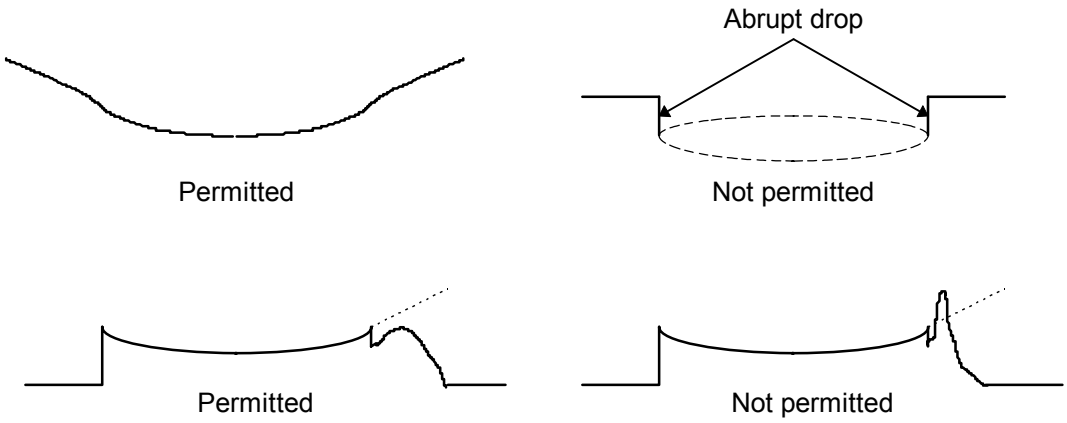


Figure 2 — Surface profile examples



Irregular profiles as shown may result in poor quality encoding.

Figure 3 — Irregular surface profile examples

6.1.2 Height of the magnetic stripe area

The vertical deviation (h) of the magnetic stripe area relative to the adjacent surface of the card shall be:

$$-0{,}005 \text{ mm } (-200 \text{ µin}) \leqslant h \leqslant 0{,}038 \text{ mm } (1500 \text{ µin})$$

Spiking in the profile caused by the material “squirt out” in hot stamping is not part of the stripe. It shall not extend above the magnetic stripe area height (h) as defined above.

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6.2 Surface roughness

The average surface roughness (R_a) of the magnetic stripe area shall not exceed 0,40 µm (15.9 µin) in both the longitudinal and transverse directions when measured according to ISO/IEC 4287.

6.3 Adhesion of stripe to card

The stripe shall not separate from the card under normal use.

6.4 Wear of magnetic stripe from read/write head

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after 2000 wear cycles and shall result in:

$$U_{A\ after} \geqslant 0{,}60\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geqslant 0{,}80\ U_{A\ after}$$

6.5 Resistance to chemicals

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after short term exposure as defined in ISO/IEC 10373-1 and shall result in:

$$U_{A\ after} \geqslant 0{,}90\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geqslant 0{,}90\ U_{A\ after}$$

Average signal amplitude (U_A) and individual signal amplitude (U_i) are measured before and after long term exposure (24 hours) to acid and alkaline artificial perspiration, as defined in ISO/IEC 10373-1.

$$U_{A\ after} \geqslant 0{,}90\ U_{A\ before} \qquad \text{and} \qquad U_{i\ after} \geqslant 0{,}90\ U_{A\ after}$$

7 Performance characteristics for the magnetic material

7.1 General

The purpose of this section is to enable magnetic interchangeability between card and processing systems. Media coercivity is not specified but is nominally 51,7 kA/m (650 Oe). The media's performance criteria, regardless of coercivity, is specified in 7.3.

NOTE The performance requirements for low coercivity cards with a nominal coercivity of 23,9 kA/m (300 Oe) are given in ISO/IEC 7811-2.

This method uses a reference card whose material is traceable to the primary standard (see clause 4). All signal amplitude results from the use of the secondary reference card must be corrected by the factor supplied with the secondary reference card. Test methods given in ISO/IEC 10373-2 shall be used.

7.2 Testing and operating environment

The testing environment for signal amplitude measurements is 23 °C ± 3 °C (73 °F ± 5 °F) and 40 % to 60 % relative humidity. When tested under otherwise identical conditions, the average signal amplitude measured at 8 ft/mm (200 ftpi) shall not deviate from its value in the above test environment by more than 15 % after 5 min exposure over the following operating environment range:

temperature	−35 °C to 50 °C (−31 °F to 122 °F)
relative humidity	5 % to 95 %

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7.3 Signal amplitude requirements for magnetic media

The requirements for recording characteristics of the card are shown in Table 1, and Figures 6 and 7.

Table 1 — Signal amplitude requirements for unused unencoded cards

Description	Density ft/mm (ftpi)	Test recording current	Signal amplitude result	Requirement
Signal amplitude	8 (200)	I_{min}	U_{A1}	$0{,}8\ U_R \leqslant U_{A1} \leqslant 1{,}3\ U_R$
Signal amplitude	8 (200)	I_{min}	U_{i1}	$U_{i1} \leqslant 1{,}36\ U_R$
Signal amplitude	8 (200)	I_{max}	U_{A2}	$U_{A1} \geqslant U_{A2} \geqslant 0{,}8\ U_R$
Signal amplitude	20 (500)	I_{max}	U_{i2}	$U_{i2} \geqslant 0{,}65\ U_R$
Resolution	20 (500)	I_{max}	U_{A3}	$U_{A3} \geqslant 0{,}7\ U_{A2}$
Erasure	0	I_{min}, DC	U_{A4}	$U_{A4} \leqslant 0{,}03\ U_R$
Extra pulse	0	I_{min}, DC	U_{i4}	$U_{i4} \leqslant 0{,}05\ U_R$
The slope of the saturation curve shall never be positive between I_{min} and I_{max}				

NOTE It is not permissible to combine the above requirements mathematically.

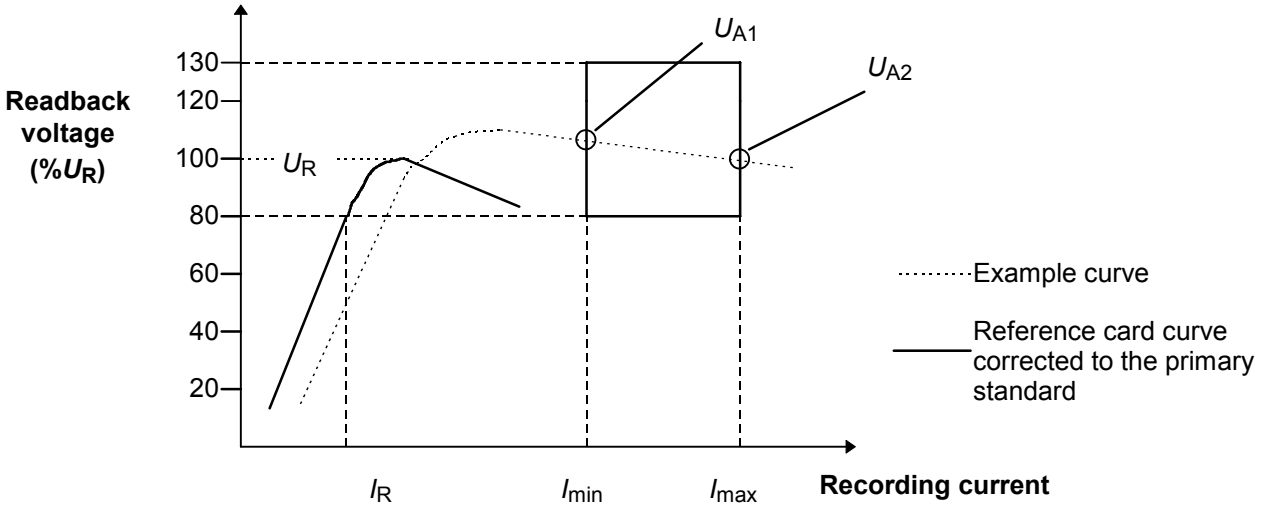


Figure 4 — Saturation curve example showing tolerance area at 8 ft/mm (200 ftpi)

NOTE The curve defines the primary standard response (on a card). The window parameters define a card that will be functional in the machine readable environment. The corrected reference curve depicted above may not meet the specifications defined in Clause 7.

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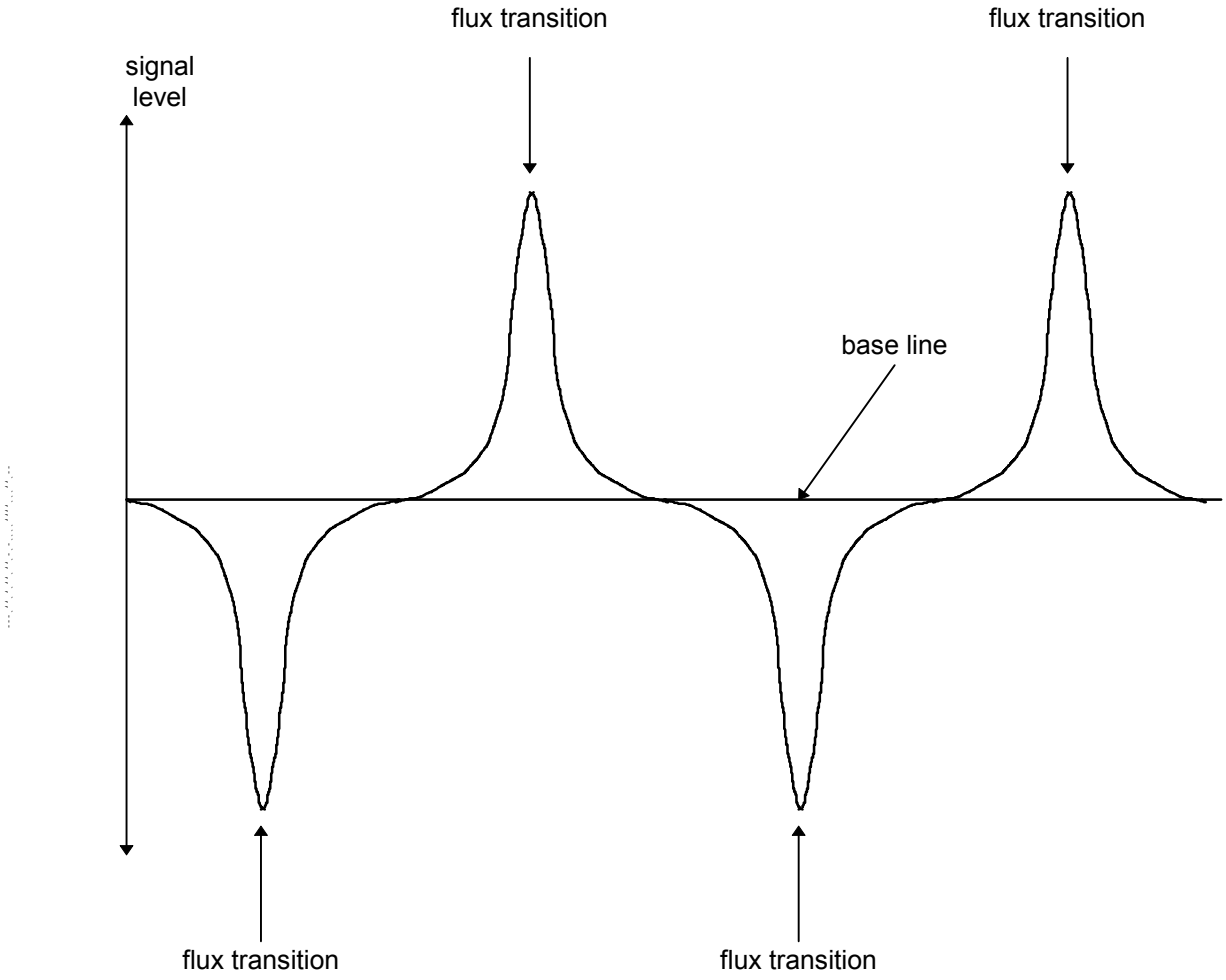


Figure 5 — Waveform example

8 Encoding technique

Encoding technique is not specified in this part of ISO/IEC 7811. The techniques and requirements in ISO/IEC 7811-2 are recommended when appropriate.

9 Encoding specification, general

Encoding specifications are not specified in this part of ISO/IEC 7811. The techniques and requirements in ISO/IEC 7811-2 are recommended when appropriate.

10 Error detection

Error detection is not specified in this part of ISO/IEC 7811. The techniques and requirements in ISO/IEC 7811-2 are recommended when appropriate.

11 Location of encoded tracks

Location of encoded tracks is not specified in this part of ISO/IEC 7811. The techniques and requirements in ISO/IEC 7811-2 are recommended when appropriate.

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