INTERNATIONAL STANDARD

ISO/IEC 7811-8

Second edition
2014-12-01

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)

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

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

This second edition cancels and replaces the first edition (ISO/IEC 7811-8:2008), which has been technically revised. Major changes from the first edition are as follows:

— The primary standard cards held by Q-Card are used to calibrate the manufacture of secondary reference cards. Other primary standard cards held by PTB and Card testing International (CTI) are used as backup to replace cards held by Q-Card as they wear out.

— The supplier of secondary reference cards has changed from PTB to Q-Card.

ISO/IEC 7811 consists of the following parts, under 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)*

— *Part 9: Tactile identifier mark*

Introduction

This part of ISO/IEC 7811 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.

— In terms of coercivity, this part of ISO/IEC 7811 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, 2 500 Oe).

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

— For Table 1 values, this part of ISO/IEC 7811 specifies different values for I_{min} (6,5 FR) and I_{max} (8 FR).

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

— Wherever possible, the same definitions, criteria, and test methods are used in ISO/IEC 7811-2, ISO/IEC 7811-6, and this part of ISO/IEC 7811.

Notes in this part of ISO/IEC 7811 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 part of ISO/IEC 7811.

Identification cards — Recording technique —

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

1 Scope

This International Standard 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.

This International Standard provides criteria to which cards are to perform. No consideration is given within this International Standard to the amount of use, if any, experienced by the card prior to test. Failure to conform to specified criteria is 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.

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 are not to 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

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

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 by Physikalisch-Technische Bundesanstalt (PTB) and maintained by PTB, Q-Card, and WG1 secretariat 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 1 to entry: Secondary standards can be ordered from Q-Card, 301 Reagan St., Sunbury, PA 17801, USA. The source of secondary standards will be maintained at least until 2018.

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 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 8 flux transitions/mm (200 flux transitions/in) 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 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 shall 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.

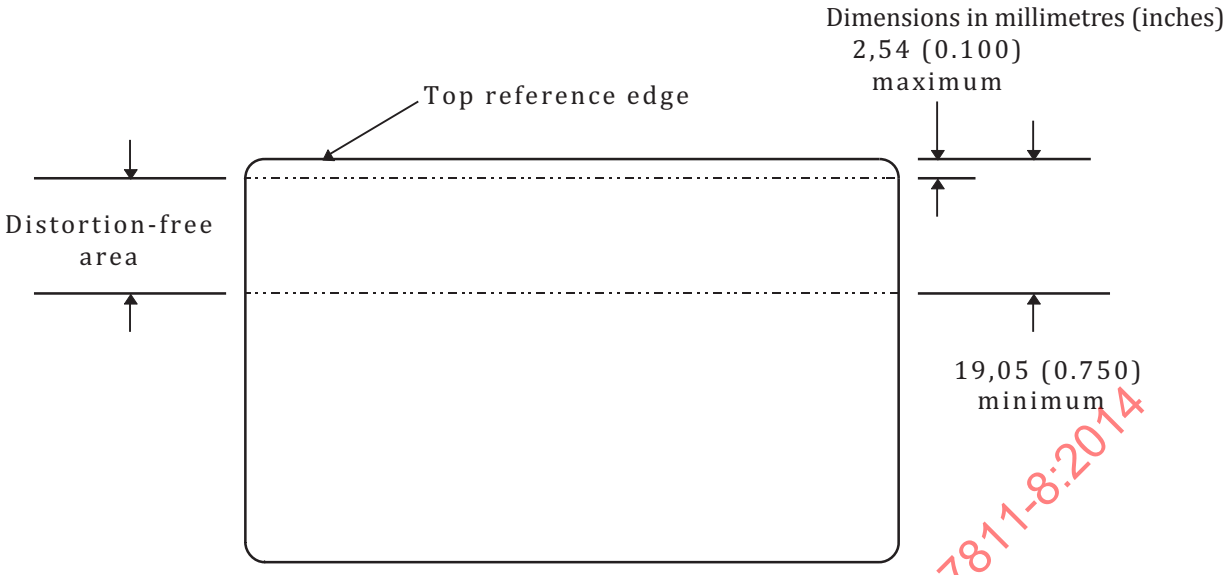


Figure 1 — Distortion-free area on card with magnetic stripe

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).

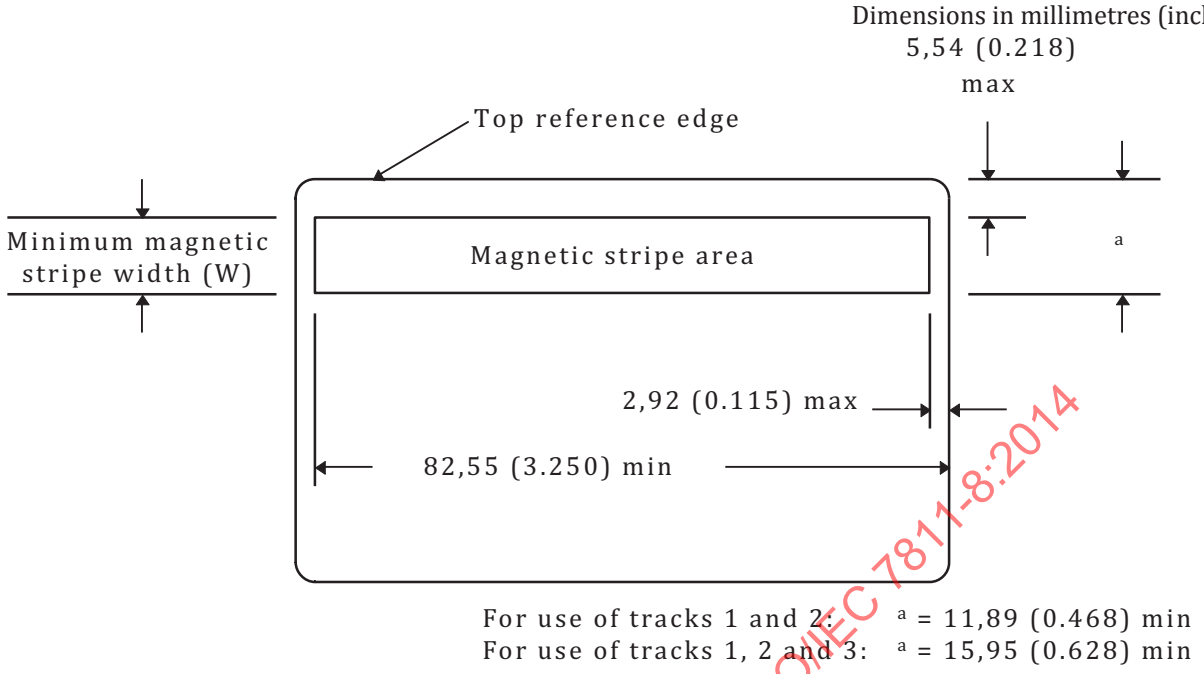
NOTE Raised areas and distortions on other areas of the card can cause card transport problems with magnetic stripe processing equipment resulting in reading or writing errors.

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.



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 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 in Figure 3, Figure 4, and Figure 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 3 a	As shown in Figure 3 b
W = 6,35 mm (0.25 in)	a ≤ 9,5 µm (375 µin)	a ≤ 5,8 µm (225 µin)
W = 10,41 mm (0.41 in)	a ≤ 15,4 µm (607 µin)	a ≤ 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 3 a	As shown in Figure 3 b
W = 6,35 mm (0.25 in)	a ≤ 7,3 µm (288 µin)	a ≤ 4,5 µm (175 µin)
W = 10,41 mm (0.41 in)	a ≤ 11,7 µm (466 µin)	a ≤ 7,3 µm (284 µin)

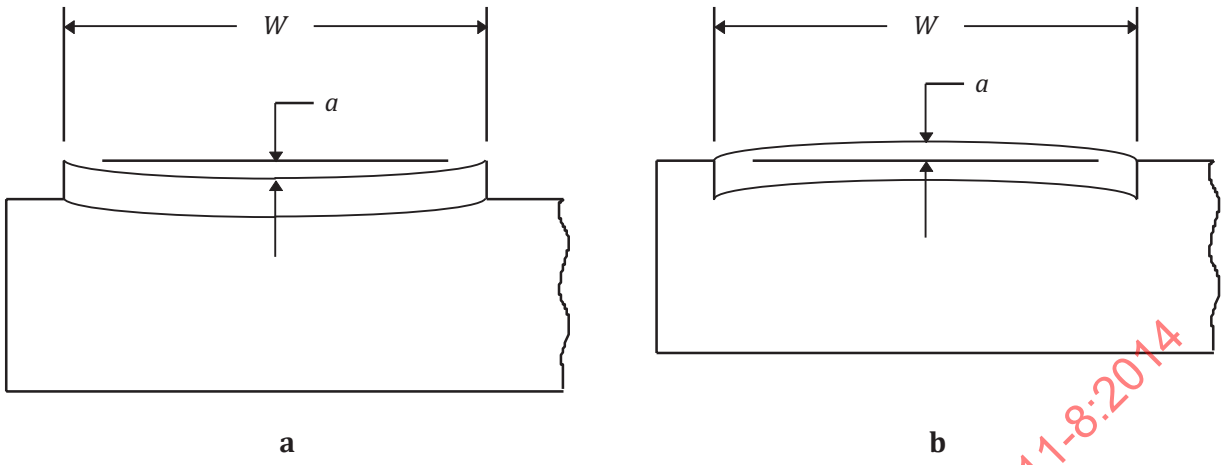


Figure 3 — Surface profile

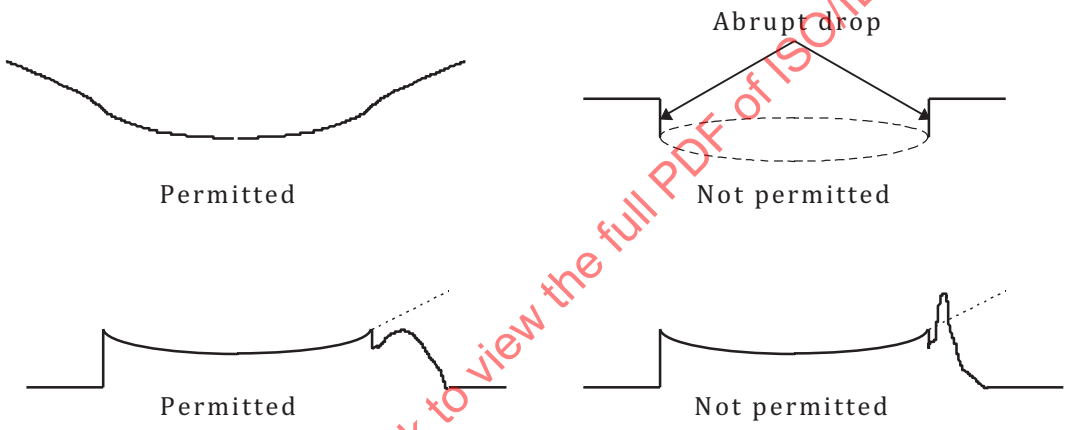


Figure 4 — Surface profile examples

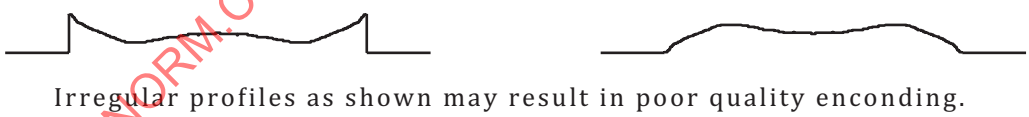


Figure 5 — Irregular surface profile examples

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:

$-0{,}005$ mm (-200 µin) ≤ h ≤ 0,038 mm (1,500 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.

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 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) measured before and after 2 000 wear cycles shall result in:

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

6.5 Resistance to chemicals

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

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

Average signal amplitude (U_A) and individual signal amplitude (U_i) measured before and after long term exposure (24 h) to acid and alkaline artificial perspiration as defined in ISO/IEC 10373-1 shall result in:

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

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 minutes exposure over the following operating environment range:

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

7.3 Signal amplitude requirements for magnetic media

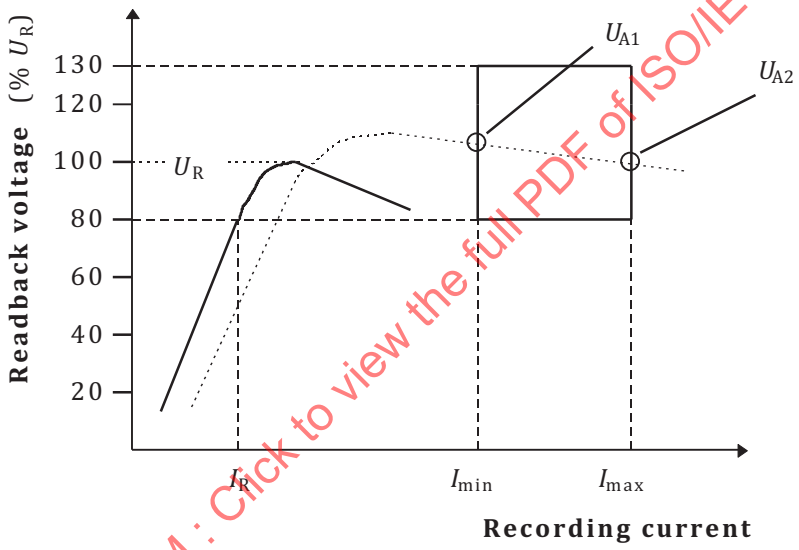
The requirements for recording characteristics of the card are shown in Table 1, Figure 6, and Figure 7.

Table 1 — Signal amplitude requirements for unused un-encoded cards

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

NOTE 1 It is not permissible to combine the above requirements mathematically.

NOTE 2 It has been observed that low resolution as measured per Table 1 can correlate with high flux transition spacing variation as measured per ISO/IEC 7811-2, Table 2.



Key

..... example curve

——— reference card curve corrected to the primary standard

Figure 6 — 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 might not meet the specifications defined in Clause 7.