INTERNATIONAL STANDARD

ISO/IEC 7811-6

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Identification cards — Recording technique —

Part 6: Magnetic stripe — High coercivity

Carte d'identification — Technique d'enregistrement — Partie 6: Piste magnétique à haute coercivité

Reference number
ISO/IEC 7811-6:1996(E)

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 on 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 7811-6 was prepared by Joint Technical Committee ISO/IEC JTC 1 *Information technology*, Subcommittee SC 17, *Identification cards and related devices.*

Annexes A to C form an integral part of this part of ISO/IEC 7811. Annex D and E is for information only.

Introduction

ISO/IEC 7811 is one of a series of standards describing the characteristics of identification cards as defined in clause 4 and the use of such cards for international interchange.

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Identification cards - Recording technique -

Part 6:
Magnetic stripe - High coercivity

1 Scope

This part of ISO/IEC 7811 specifies characteristics for a high coercivity magnetic stripe (including any protective overlay) on an identification card, the encoding technique and coded character sets.

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.

For the testing of these card requirements refer to ISO/IEC 10373.

This part of ISO/IEC 7811 specifies the requirements for cards used for identification. It takes into consideration both human and machine aspects and states minimum requirements.

2 Conformance

An identification card is in conformance with this part of ISO/IEC 7811 if it meets all mandatory requirements specified herein.

A prerequisite for conformance with this part of ISO/IEC 7811 is conformance to ISO/IEC 7810.

NOTE 1 - 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 be neither intermixed nor reconverted. The original design was made using the Imperial measurement system.

[1] Currently under revision.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 7811. 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 7811 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 4287-1:1984[1] - *Surface roughness - Terminology - Part 1: Surface and its parameters.*

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 - Tracks 1 and 2.*

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

ISO/IEC 10373:1993, *Identification cards - Test methods.*

4 Definitions

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

4.1 primary standard: The primary standard is a set of reference cards which represents the values of U_R and I_R. The values and cards are established and maintained by Physikalisch-Technische Bundesanstalt (PTB).

4.2 secondary standard: The calibration system which supports this International Standard supplies secondary standards, designated RM7811-6, from which tertiary standards may be calibrated and supplied. The relationship between these secondary references and the primary standard is defined in the calibration certificate supplied with each card.

NOTE 2 - Secondary reference cards can be ordered from Physikalisch-Technische Bundesanstalt (PTB), Lab. 1.41 - Bundesallee 100, D 38116 Braunschweig, Germany. The source of secondary standards will be maintained for at least 10 years from the initial release of this part of ISO/IEC 7811.

4.3 unused un-encoded card: A card possessing all the components required for its intended purpose, which has not been subjected to any personalization or testing operation. The card has been stored in a clean environment without 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: An unused, un-encoded card according to paragraph 4.3 which has only been encoded with all the data required for its intended purpose (e.g. magnetic encoding, embossing, electronic encoding). Any subsequent verification of encoded data is part of the encoding process and shall not alter encoded characteristics of the card. The environmental conditions in which the unused encoded card experiences are to be the same as for unused un-encoded card.

4.5 returned card: An embossed and/or encoded card after it has been issued to the card holder and returned for the purpose of testing.

4.6 flux transition: The location of the maximum of the magnetic flux component normal to the surface of the magnetic stripe.

4.7 reference current (I_R): The minimum recorded current amplitude which causes on the reference card, under the given test conditions, a readback voltage amplitude equal to 80% of the reference signal amplitude U_R, (see figure 5) at a density of 8 ft/mm (ft/mm = flux transitions per millimetre) [200 ftpi (ftpi = flux transitions per inch)].

4.8 demagnetisation current (I_d): The D C current value which reduces the average signal amplitude to 80% of the reference signal amplitude (U_R) on a reference card which has been encoded at a density of 20 ft/mm (500 ftpi) at a current of I_{min}.

4.9 reference flux level (F_R): The flux level in the test head that corresponds to the reference current I_R.

4.10 test recording currents: These values define two recording currents:

I_{min} = Recording current corresponding to 2,8 F_R

I_{max} = Recording current corresponding to 3,5 F_R

4.11 individual signal amplitude (U_i): The base-to-peak amplitude of a single readback voltage signal.

4.12 average signal amplitude (U_A): The average signal amplitude (U_A) is the 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.

$$U_A = \frac{\sum_{k=1}^{n} \left| U_{ik} \right|}{n}$$

4.13 reference signal amplitude (U_R): The maximum value of the average signal amplitude of a reference card corrected to the primary standard.

4.14 physical recording density: The number of flux transitions per unit length recorded on a track.

NOTE 3 - When testing with densities of 6 ft/mm (150 ftpi) and 16,6 ft/mm (420 ftpi) the correlation factors are:

$$\frac{U_A \text{ at 6 ft/mm (150 ftpi)}}{U_A \text{ at 8 ft/mm (200 ftpi)}} \times 100 = 100\ \%$$

$$\frac{U_A \text{ at 16,6 ft/mm (420ftpi)}}{U_A \text{ at 20 ft/mm (500 ftpi)}} \times 100 = 102\ \%$$

4.15 bit density: The number of data bits stored per unit of length (bits per mm or bits per inch).

4.16 bit cell: The distance between two clocking flux transitions. See figure 9.

4.17 sub interval: Nominally half the distance between two flux transitions. See figure 9.

4.18 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.

5 Physical characteristics of the identification card

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

6 Physical characteristics of the magnetic stripe

6.1 Height and Surface profile of the magnetic stripe area

The magnetic stripe area is shown in figures 1 and 2.

6.1.1 Surface profile of the magnetic stripe area

The transverse surface profile of the magnetic stripe area shall not show a vertical deviation (a) of more than:

as shown in figure 3a:
$a \leq 9{,}5$ µm (375 µin) for the minimum width $W = 6{,}35$ mm (0.25 in)
$a \leq 15{,}4$ µm (607 µin) for the minimum width $W = 10{,}28$ mm (0.405 in)

as shown in figure 3b:
$a \leq 5{,}8$ µm (225 µin) for the minimum width $W = 6{,}35$ mm (0.25 in)
$a \leq 9{,}3$ µm (365 µin) for the minimum width $W = 10{,}28$ mm (0.405 in)

When the value of the bending stiffness of the card is less than 20 mm, the vertical deviation (a) shall be:
as shown in figure 3a:
$a \leq 7{,}3$ µm (288 µin) for the minimum width $W = 6{,}35$ mm (0.25 in)
$a \leq 11{,}7$ µm (466 µin) for the minimum width $W = 10{,}28$ mm (0.405 in)

as shown in figure 3b:
$a \leq 4{,}5$ µm (175 µin) for the minimum width $W = 6{,}35$ mm (0.25 in)
$a \leq 7{,}3$ µm (284 µin) for the minimum width $W = 10{,}28$ mm (0.405 in)
See figures 1, 2, 3 and 4.

6.1.2 Height of the magnetic stripe area

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

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

NOTE 4 - 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 0,4 µm (15.9 µin) in both the longitudinal and transverse directions. Refer to ISO/IEC 4287 Part 1.

6.3 Adhesion of stripe to card

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

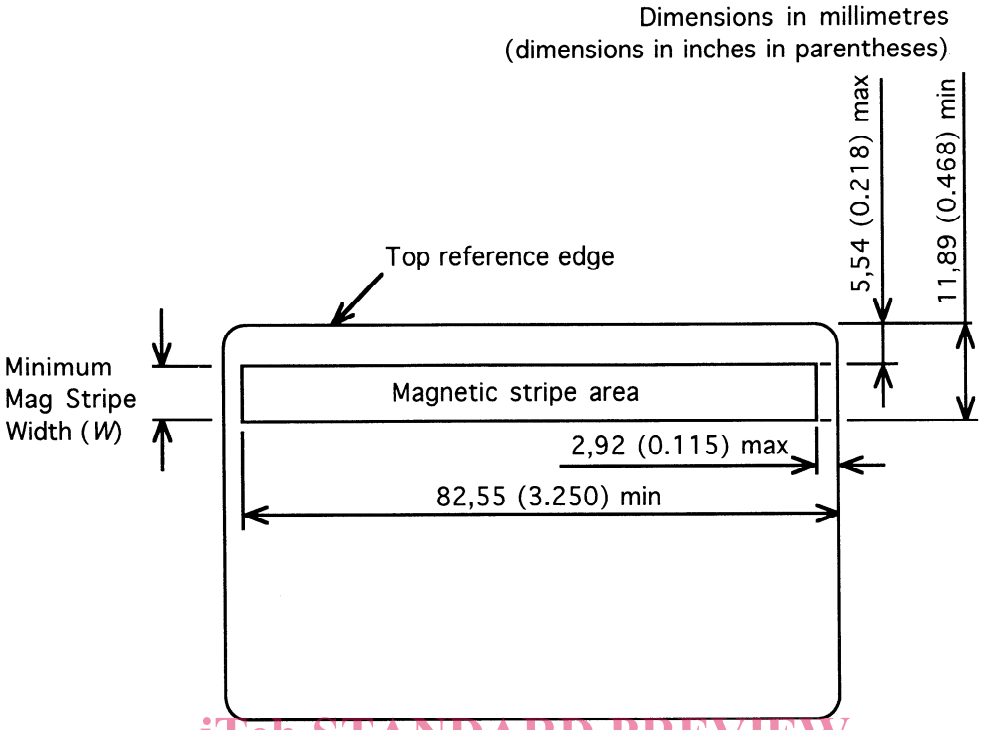


Figure 1 - Location of magnetic material for tracks 1 and 2 only on ID-1 type card

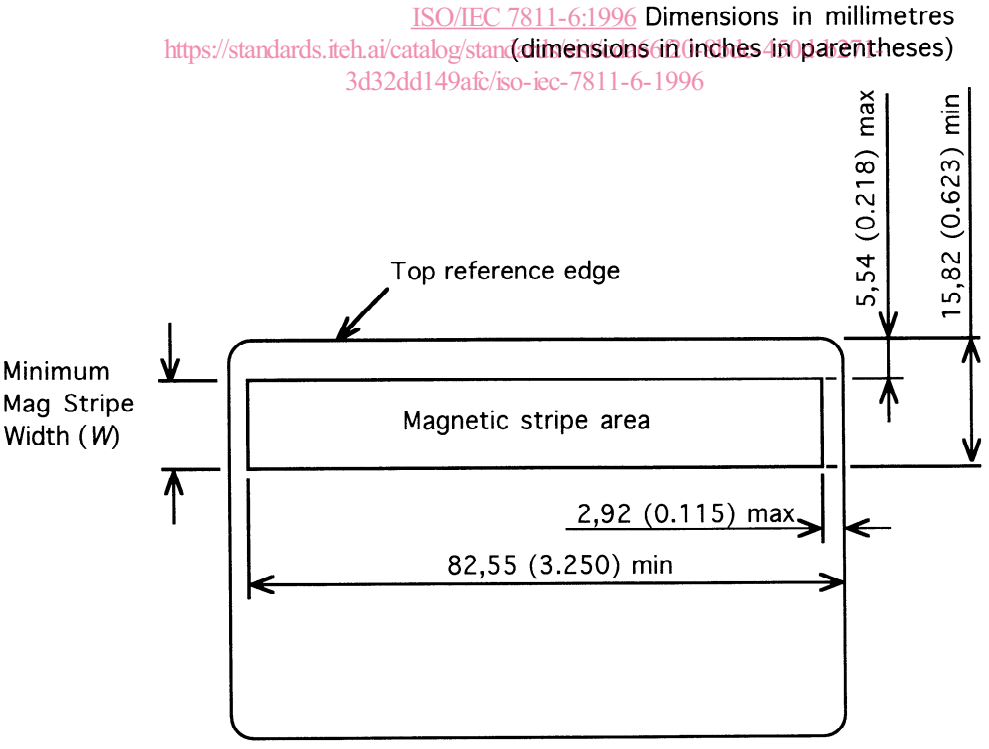
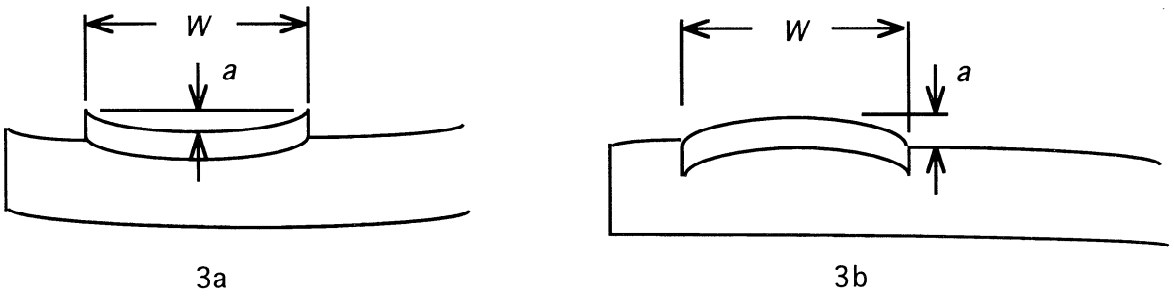
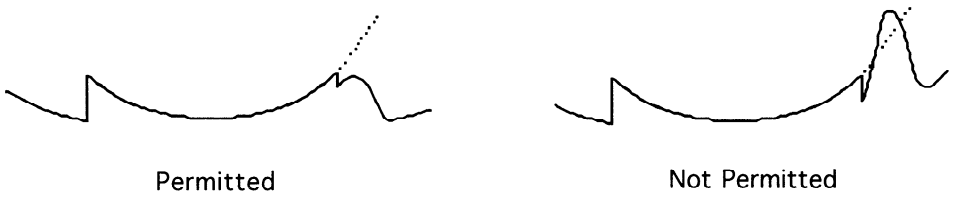


Figure 2 - Location of magnetic material for tracks 1, 2 and 3 on ID-1 type card



3a 3b

Figure 3 - Surface Profile



NOTE 5 - Irregular profiles as shown below may result in poor quality encoding.

Figure 4 - Profile Examples

6.4 Wear from Read/Write Head

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

U_A after $\geq$ 0,60 U_A before

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) are measured before and after short term exposure, as defined in the Test Method reference document.

U_A after $\geq$ 0,90 U_A before

U_i after $\geq$ 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 the Test Method reference document.

U_A after $\geq$ 0,90 U_A before

U_i after $\geq$ 0,90 U_A after

7 Performance characteristics for the magnetic material.

The purpose of this section is to enable magnetic interchangeability between card and processing systems.

NOTE 6 - Media coercivity is not specified. The media's performance criteria, regardless of coercivity, is specified in 7.3.

7.1 General

This method uses a reference card whose material is traceable to the primary standard (see 4.1, 4.2).

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 minute exposure over the following operating environment range:

temperature: - 35 °C to 50 °C
(-30 °F to 122 °F)

relative humidity: 5% to 95% with a wet bulb temperature of 25 °C (77 °F)

7.3 Signal amplitude requirements for magnetic media

The requirements for recording characteristics of the card are shown in table 1 and figures 5 and 6.

Table 1 - Unused Unencoded Cards

Description	Densities ft/mm	ftpi	Test Recording Current	Signal Amplitude Result	Requirement
Signal Amplitude	8	200	I_{min}	U_{A1}	$0{,}8\ U_R \le U_{A1} \le 1{,}2\ U_R$
Signal Amplitude	8	200	I_{min}	U_{i1}	$U_{i1} \le 1{,}26\ U_R$
Signal Amplitude	8	200	I_{max}	U_{A2}	$U_{A2} \ge 0{,}8\ U_R$
Signal Amplitude	20	500	I_{max}	U_{i2}	$U_{i2} \ge 0{,}68\ U_R$
Resolution	20	500	I_{max}	U_{A3}	$U_{A3} \ge 0{,}7\ U_{A2}$
Erasure	0	0	I_{min}, DC	U_{A4}	$U_{A4} \le 0{,}03\ U_R$
Extra Pulse	0	0	I_{min}, DC	U_{i4}	$U_{i4} \le 0{,}05\ U_R$
Demagnetization	0	0	I_d, DC	U_{A5}	$U_{A5} \ge 0{,}64\ U_R$
Demagnetization	0	0	I_d, DC	U_{i5}	$U_{i5} \ge 0{,}54\ U_R$
Waveform	3	75	I_{max}	U_{i6}, U_{A6}	$U_{i6} \le 0{,}05\ U_{A6}$
The slope of the saturation curve shall never be positive between I_{min} and I_{max}.					

NOTE 7 - It is not permissible to combine the above requirements mathematically.

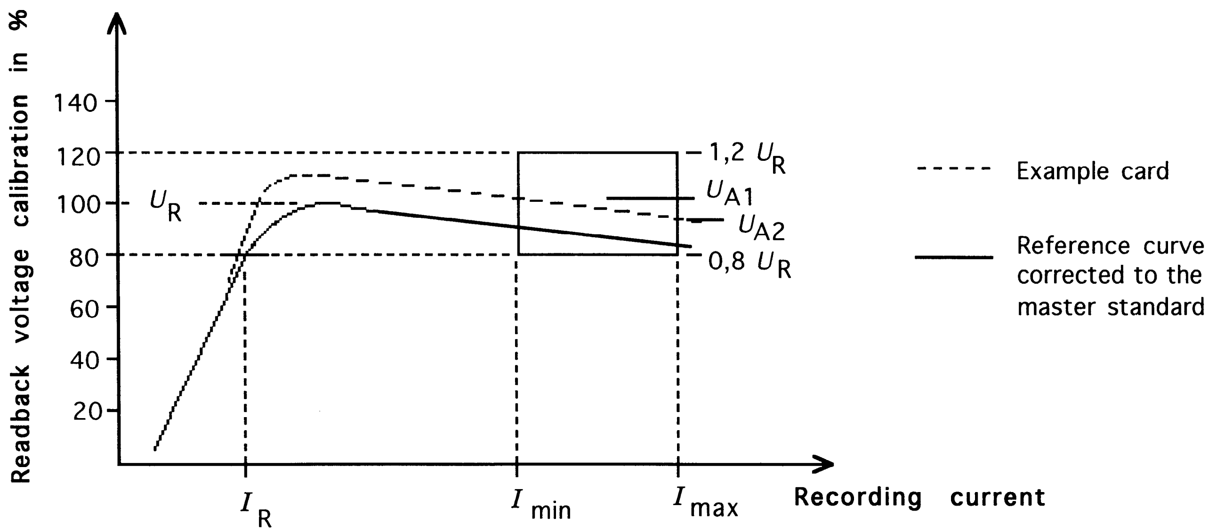
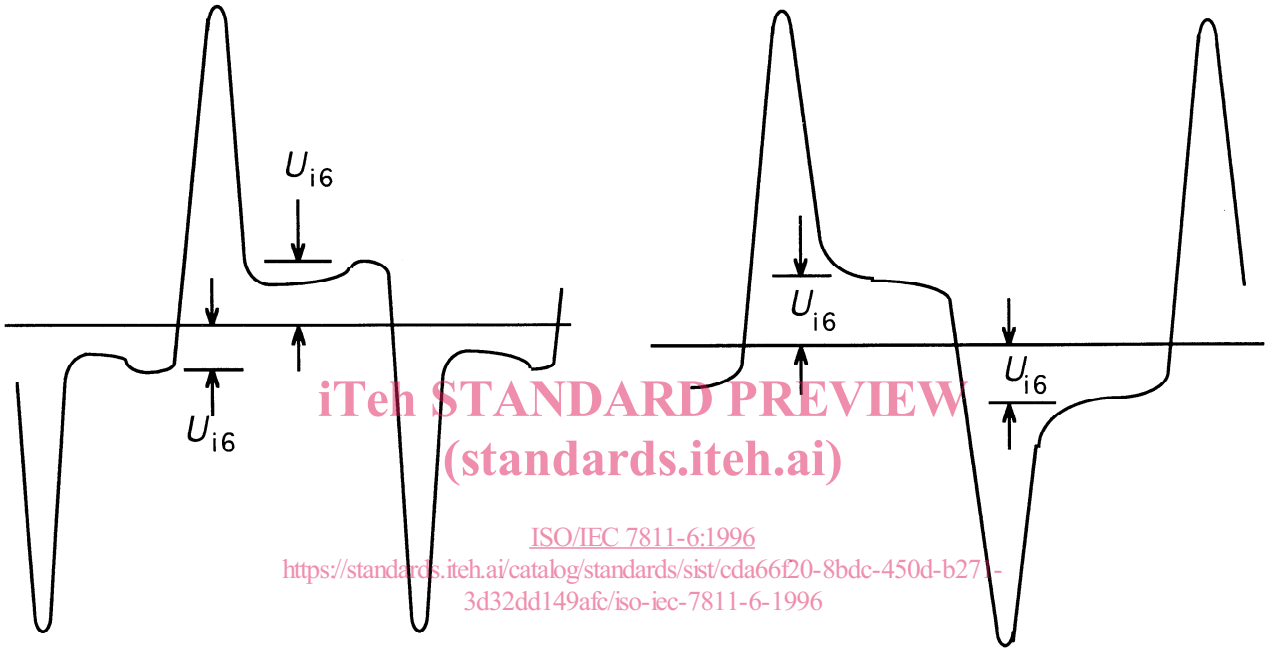


Figure 5 - Saturation curve of Secondary Reference Card and tolerance area at 8 ft/mm (200 ftpi)

NOTE 8 - The curve defines the master standard response (on a card). The window parameters are defined to produce a card that will be functional in the machine readable environment.



Extra peak Flat area

NOTE 9 - U_{i6} is measured at a point of minimum slope and maximum amplitude between flux transitions.

Figure 6 - Waveform Examples