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Cards and security devices for personal identification — Contactless vicinity objects —

Part 2: Air interface and initialization

Cartes et dispositifs de sécurité pour l'identification personnelle — Objets sans contact de voisinage —
Partie 2: Interface et initialisation dans l'air

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*.

This third edition cancels and replaces the second edition (ISO/IEC 15693-2:2006), which has been technically revised.

The main changes compared to the previous edition are as follows:

— fast response data rates in 8.4.3 and Annex B have been added.

A list of all parts in the ISO/IEC 15693 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

ISO/IEC 15693 (all parts) is one of a series of International Standards defining the parameters for identification cards as defined in ISO/IEC 7810 and the use of such cards for international interchange.

This document defines the electrical characteristics of the contactless interface between a vicinity card and a vicinity coupling device. The interface includes power and bi-directional communications.

Contactless card standards cover a variety of types as embodied in ISO/IEC 10536 (close-coupled cards), ISO/IEC 14443 (proximity cards) and ISO/IEC 15693 (vicinity cards). These are intended for operation when very near, nearby and at a longer distance from associated coupling devices, respectively.

Cards and security devices for personal identification — Contactless vicinity objects —

Part 2: Air interface and initialization

1 Scope

This document specifies the nature and characteristics of the fields to be provided for power and bi-directional communications between vicinity coupling devices (VCDs) and vicinity cards (VICCs).

This document is intended to be used in conjunction with other parts of the ISO/IEC 15693 series.

This document does not preclude the incorporation of other standard technologies on the card as described in Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10373-7[1], *Cards and security devices for personal identification — Test methods — Part 7: Contactless vicinity objects*

ISO/IEC 15693-1, *Cards and security devices for personal identification — Contactless vicinity objects — Part 1: Physical characteristics*

ISO/IEC 15693-3, *Cards and security devices for personal identification — Contactless vicinity objects — Part 3: Anticollision and transmission protocol*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15693-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
modulation index
index equal to [*a*-*b*]/[*a*+*b*] where *a* and *b* are the peak and minimum signal amplitudes, respectively

Note 1 to entry: The value of the index may be expressed as a percentage.

3.2
subcarrier
signal of frequency f_s used to modulate the carrier of frequency f_c

1) Under preparation.

3.3
byte
string that consists of 8 bits of data designated b1 to b8, from the most significant bit (MSB,b8) to the least significant bit (LSB,b1)

4 Symbols and abbreviated terms

4.1 Abbreviated terms

ASK	amplitude shift keying
EOF	end of frame
LSB	least significant bit
MSB	most significant bit
PPM	pulse position modulation
RF	radio frequency
SOF	start of frame
VCD	vicinity coupling device
VICC	vicinity integrated circuit card

4.2 Symbols

a	carrier amplitude without modulation
b	carrier amplitude when modulated
f_c	frequency of the operating field (carrier frequency)
f_s	frequency of the subcarrier
H_{max}	maximum operating field
H_{min}	minimum operating field

5 Initial dialogue for vicinity cards

The dialogue between the VCD and the VICC (one or more VICCs may be present at the same time) is conducted through the following consecutive operations:

— activation of the VICC by the RF operating field of the VCD;

— VICC waits silently for a command from the VCD;

— transmission of a command by the VCD;

— transmission of a response by the VICC.

These operations use the RF power transfer and communication signal interface specified in the following clauses and shall be performed according to the protocol defined in ISO/IEC 15693-3.

6 Power transfer

6.1 General

Power transfer to the VICC is accomplished by radio frequency via coupling antennas in the VCD and in the VICC. The RF operating field that supplies power to the VICC from the VCD is modulated for communication from the VCD to the VICC, as described in Clause 7.

6.2 Frequency

The frequency f_c of the RF operating field is 13,56 MHz ± 7 kHz.

6.3 Operating field

A VICC shall operate as intended continuously between H_{min} and H_{max}.

The minimum operating field is H_{min} and has a value of 150 mA/m rms.

The maximum operating field is H_{max} and has a value of 5 A/m rms.

A VCD shall generate a field of at least H_{min} and not exceeding H_{max} at the manufacturer's specified positions (operating volume).

In addition, the VCD shall be capable of powering any single reference VICC (defined in the test methods) at the manufacturer's specified positions (within the operating volume).

The VCD shall not generate a field higher than the value specified in ISO/IEC 15693-1 (alternating magnetic field) in any possible VICC position.

Test methods for determining the VCD operating field are defined in ISO/IEC 10373-7.

7 Communications signal interface VCD to VICC

7.1 General

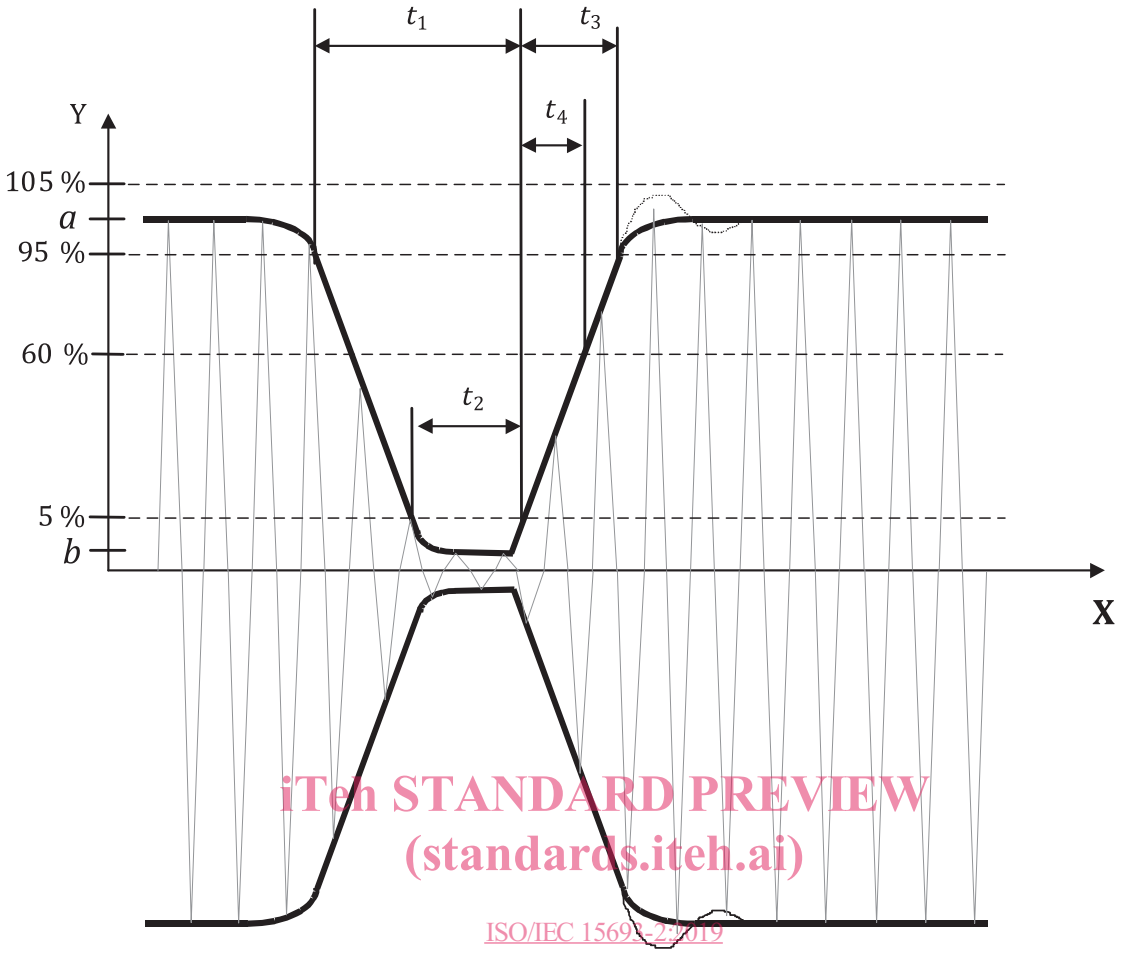
For some parameters several modes have been defined in order to meet different international radio regulations and different application requirements.

From the modes specified any data coding can be combined with any modulation.

7.2 Modulation

Communications between the VCD and the VICC take place using the modulation principle of ASK. Two modulation indexes are used, 10 % and 100 %. The VICC shall decode both. The VCD determines which index is used.

Depending on the choice made by the VCD, a "pause" will be created as described in Figure 1 and Figure 2.



Key

X time, in seconds

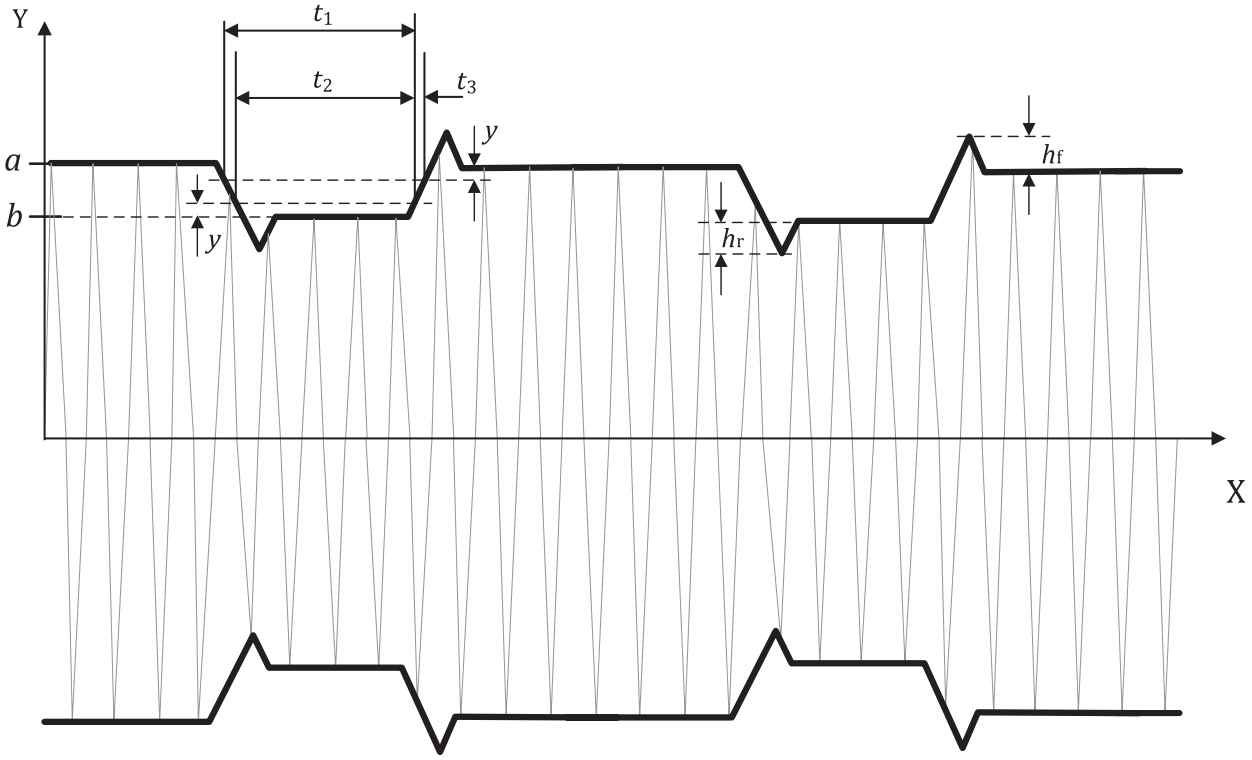
Y carrier amplitude

Figure 1 — Modulation of the carrier for 100 % ASK

The VCD shall generate the "pause" with timing parameters defined in Table 1.

Table 1 — VCD transmission: "pause" timing parameters for 100 % ASK

Parameter	Minimum	Maximum
t_1	6,0 µs	9,44 µs
t_2	2,1 µs	t_1
t_3	0 µs	4,5 µs
t_4	0 µs	0,8 µs



Key

X time, in seconds

Y carrier amplitude

Figure 2 — Modulation of the carrier for 10 % ASK

The VCD shall generate the "pause" with timing and amplitude parameters defined in Table 2.

Table 2 — VCD transmission: "pause" timing parameters for 10 % ASK

Parameter	Condition	Minimum	Maximum
t_1	$y = 0{,}05 \times (a - b)$	6,0 µs	9,44 µs
t_2		3,0 µs	t_1
t_3		0 µs	4,5 µs
Modulation index		10 %	30 %
h_f, h_r		0	$0{,}1 \times (a - b)$

The VICC shall be operational for any value of modulation index between 10 % and 30 %.

The digital generation of the pause by the VCD, shown approximately in 7.3 and 7.4 as t_{pause}, shall not cause t_{1max} as defined in Figures 1 and 2 to be exceeded.

7.3 Data rate and data coding

7.3.1 General

Data coding shall be implemented using pulse position modulation.

Two data coding modes shall be supported by the VICC. The selection shall be made by the VCD and indicated to the VICC within the SOF, as defined in 7.4.