INTERNATIONAL STANDARD

ISO/IEC 14443-1

Fourth edition
2018-04

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

Part 1: Physical characteristics

Cartes et dispositifs de sécurité pour l'identification personnelle — Objets sans contact de proximité —

Partie 1: Caractéristiques physiques

Reference number
ISO/IEC 14443-1:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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.

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 (http://www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (http://www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and security devices for personal identification*.

This fourth edition cancels and replaces the third edition (ISO/IEC 14443-1:2016), which has been technically revised.

A list of all the parts in the ISO/IEC 14443 series, can be found on the ISO website.

Introduction

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

The ISO/IEC 14443 series of standards defines the technology-specific requirements for identification cards conforming to ISO/IEC 7810 and thin flexible cards conforming to ISO/IEC 15457-1 and the use of such cards to facilitate international interchange. However, it also recognizes that the technology offers the possibility that proximity objects may be provided in forms other than that of the International Standard card formats. Furthermore, it does not preclude the incorporation of other standard technologies on the card, such as those referenced in the Bibliography.

The ISO/IEC 14443 series of standards accommodates the operation of proximity cards in the presence of other contactless cards conforming to the ISO/IEC 10536 series of standards and the ISO/IEC 15693 series of standards.

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

Part 1: Physical characteristics

1 Scope

This document defines the physical characteristics of proximity cards (PICCs).

It is intended to be used in conjunction with other parts of ISO/IEC 14443.

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 7810, *Identification cards — Physical characteristics*

ISO/IEC 14443-2:2016, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*

ISO/IEC 15457-1, *Identification cards — Thin flexible cards — Part 1: Physical characteristics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7810, ISO/IEC 15457-1 and the following apply.

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

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

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

3.1
integrated circuit
IC
electronic component designed to perform processing and/or memory functions

3.2
contactless
achievement of signal exchange with, and supply of power to, the card without the use of galvanic elements

Note 1 to entry: It is also the absence of an ohmic path from the external interfacing equipment to the integrated circuit(s) contained within the card.

3.3
contactless integrated circuit card
card into which *integrated circuit* (3.1) and coupling means have been placed, such that communication to such integrated circuit is done in a *contactless* (3.2) manner

3.4
operate as intended
operates in the manner described by the manufacturer's specification in accordance with ISO/IEC 14443

3.5
PICC
contactless integrated circuit card (3.3) or other object with which communication and power transfer are done by inductive coupling in proximity of a coupling device

Note 1 to entry: Commonly called a proximity card.

3.6
PICC antenna zone
for each class a zone defined by an external geometrical shape and when defined an internal geometrical shape

3.7
PICC class
combination of antenna dimension and loading effect

Note 1 to entry: See Annex A.

4 Physical characteristics

4.1 General

The PICC may be in the form of a card compliant with ISO/IEC 7810 or ISO/IEC 15457-1, or an object of any other dimension.

4.2 Antenna

If the PICC dimensions are not compliant with ISO/IEC 7810 or ISO/IEC 15457-1, the dimensions of the PICC antenna shall not exceed 86 mm × 54 mm × 3 mm.

NOTE This antenna size restriction stems from the fact that the radio frequency power and signal interface defined in ISO/IEC 14443-2 and its test methods in ISO/IEC 10373-6 are based on ID-1 cards.

4.3 Additional requirements for PICC classes

It has been established that the use of a prescribed PICC class within an industry sector may enhance interoperability within that sector. The use of a PICC class is optional. If used, PICCs shall comply with the requirements given in Annex A.

4.4 Alternating magnetic field

If the PICC meets the requirements of one particular class as specified in Annex A, then the PICC, whichever form the PICC has according to 4.1, shall continue to operate as intended after continuous exposure to a magnetic field of an average level of 4/3 times H_{max} at 13,56 MHz as specified in ISO/IEC 14443-2:2016, 6.2 for this class. The averaging time is 30 s and the maximum level of the magnetic field is limited to 8/5 times H_{max}.

If the PICC does not claim to meet the requirements of one particular class as specified in Annex A, then the PICC, whichever form the PICC has according to 4.1, shall continue to operate as intended after continuous exposure to a magnetic field of an average level of 10 A/m (rms) at 13,56 MHz. The averaging time is 30 s and the maximum level of the magnetic field is limited to 12 A/m (rms).

Annex A
(normative)

PICC class definitions

A.1 "Class 1"

The support of "Class 1" PICCs is mandatory for PCDs.

The antenna of a "Class 1" PICC shall be located within a zone defined by two rectangles, as shown in Figure A.1:

1) external rectangle: 81 mm × 49 mm;

2) internal rectangle: 64 mm × 34 mm, centered in the external rectangle, with 3 mm corner radii.

The antenna of a "Class 1" PICC shall encircle the internal rectangle of the PICC antenna zone.

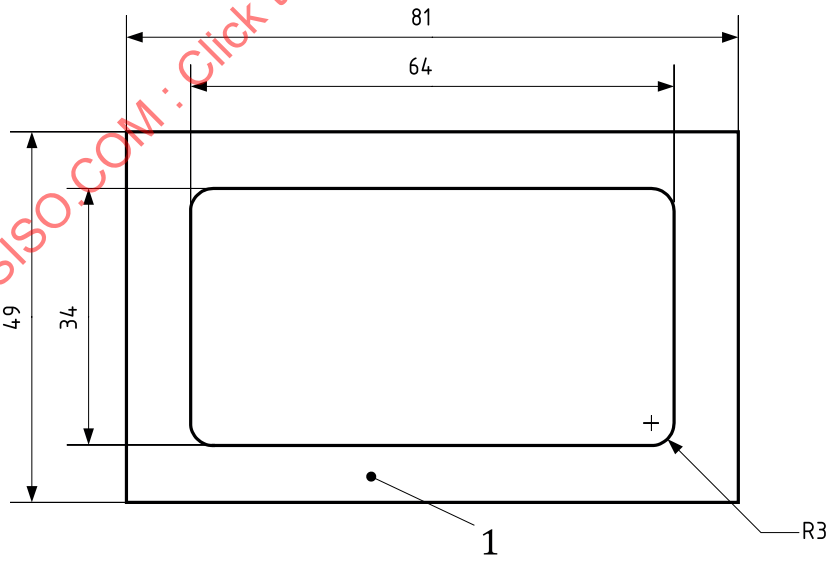
The antenna of a "Class 1" PICC shall fit into a zone which shall not differ by more than 300 mm^2 from the "Class 1" PICC antenna zone, respecting:

1) the connections to the ends of the antenna coil may be outside of the defined zone, and

2) parts of the antenna coil may be inside the internal rectangle.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



Key

1 PICC antenna zone

Figure A.1 — Location of the antenna of the "Class 1" PICC

The antenna of a PICC with ID-1 dimensions (as defined in ISO/IEC 7810 or ISO/IEC 15457-1) should be centered.

A.2 “Class 2”

The support of “Class 2” PICCs is mandatory for PCDs.

The antenna of a “Class 2” PICC shall be located within a zone defined by two rectangles, as specified in Figure A.2:

1) external rectangle: 81 mm × 27 mm;

2) internal rectangle: 51 mm × 13 mm, located at 7 mm and 8,5 mm from the external rectangle, with 3 mm corner radii.

The antenna of a “Class 2” PICC shall encircle the internal rectangle of the PICC antenna zone.

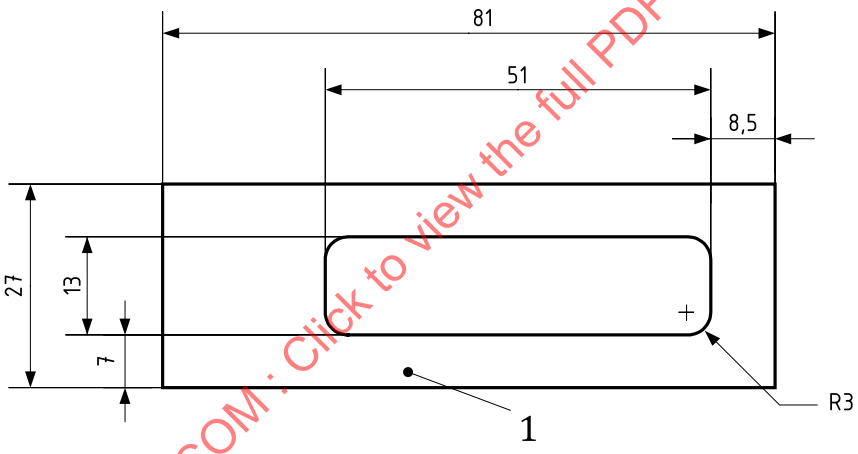
The antenna of a “Class 2” PICC shall fit into a zone which shall not differ by more than 150 mm^2 from the “Class 2” PICC antenna zone, respecting:

1) the connections to the ends of the antenna coil may be outside of the defined zone, and

2) parts of the antenna coil may be inside the internal rectangle.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



Key

1 PICC antenna zone

Figure A.2 — Location of the antenna of the “Class 2” PICC

A.3 “Class 3”

The support of “Class 3” PICCs is mandatory for PCDs.

The antenna of a “Class 3” PICC shall be located within a zone defined by either two rectangles:

1) external rectangle: 50 mm × 40 mm;

2) internal rectangle: 35 mm × 24 mm, centered in the external rectangle, with 3 mm corner radii;

or two circles:

3) external circle with diameter 50 mm;

4) internal circle with diameter 32 mm, concentric with the external circle;

as specified in Figure A.3.

The antenna of a “Class 3” PICC shall encircle the internal rectangle or circle of the PICC antenna zone.

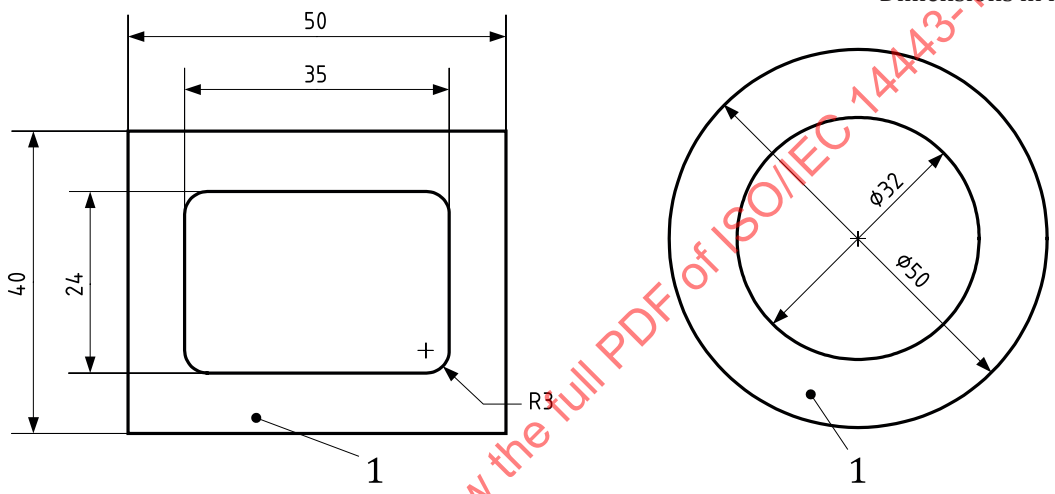
The antenna of a “Class 3” PICC shall fit into a zone which shall not differ by more than 150 mm^2 from the “Class 3” PICC antenna zone, respecting:

1) the connections to the ends of the antenna coil may be outside of the defined zone, and

2) parts of the antenna coil may be inside the internal rectangle or circle.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



Key

1 PICC antenna zone

Figure A.3 — Location of the antenna of the “Class 3” PICC

A.4 “Class 4”

The support of “Class 4” PICCs is optional for PCDs.

The antenna of a “Class 4” PICC shall be located within a zone defined by either two rectangles:

1) external rectangle: 50 mm × 27 mm;

2) internal rectangle: 35 mm × 13 mm, centered in the external rectangle, with 3 mm corners radii;

or two circles:

3) external circle with diameter 41 mm;

4) internal circle with diameter 24 mm, concentric with the external circle;

as specified in Figure A.4.

The antenna of a “Class 4” PICC shall encircle the internal rectangle or circle of the PICC antenna zone.

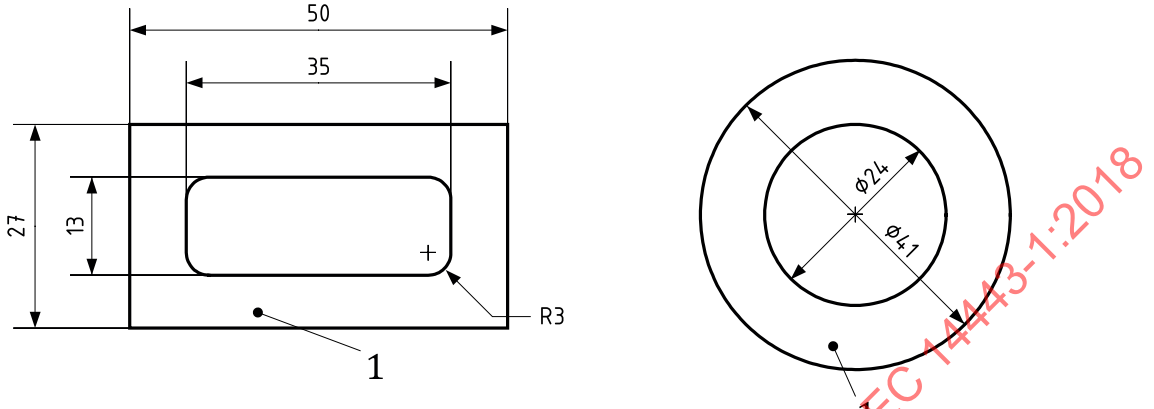
The antenna of a “Class 4” PICC shall fit into a zone which shall not differ by more than 100 mm^2 from the “Class 4” PICC antenna zone, respecting:

1) the connections to the ends of the antenna coil may be outside of the defined zone, and

2) parts of the antenna coil may be inside the internal rectangle or circle.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



Key

1 PICC antenna zone

Figure A.4 — Location of the antenna of the "Class 4" PICC

A.5 "Class 5"

The support of "Class 5" PICCs is optional for PCDs.

The antenna of a "Class 5" PICC shall be located within a zone defined by either two rectangles:

1) external rectangle: 40,5 mm × 24,5 mm;

2) internal rectangle: 25 mm × 10 mm, centered in the external rectangle, with 3 mm corners radii;

or two circles:

3) external circle with diameter 35 mm;

4) internal circle with diameter 18 mm, concentric with the external circle;

as specified in Figure A.5.

The antenna of a "Class 5" PICC shall encircle the internal rectangle or circle of the PICC antenna zone.

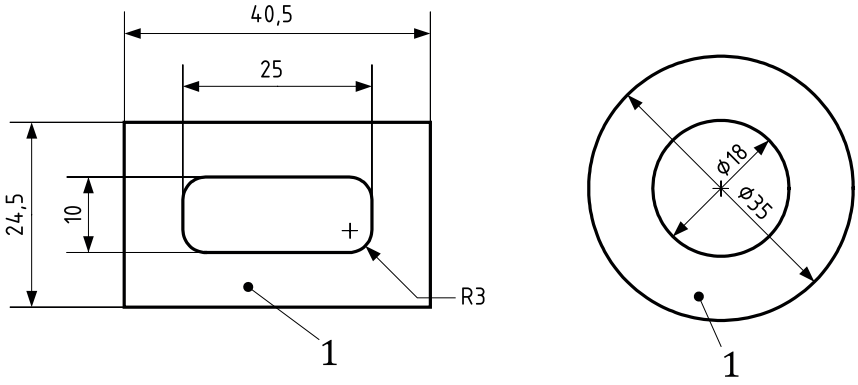
The antenna of a "Class 5" PICC shall fit into a zone which shall not differ by more than 70 mm^2 from the "Class 5" PICC antenna zone, respecting:

1) the connections to the ends of the antenna coil may be outside of the defined zone, and

2) parts of the antenna coil may be inside the internal rectangle or circle.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



Key

1 PICC antenna zone

Figure A.5 — Location of the antenna of the "Class 5" PICC

A.6 "Class 6"

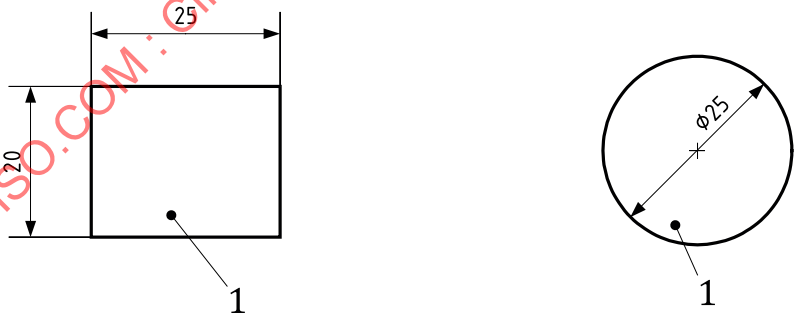
The support of "Class 6" PICCs is optional for PCDs.

The antenna of a "Class 6" PICC shall be located within a zone defined by either a rectangle of dimensions 25 mm × 20 mm or a circle of 25 mm diameter, as specified in Figure A.6.

The connections to the ends of the antenna coil may be outside of the defined zone with a maximum area of 30 mm^2.

Unless the PICC manufacturer declares otherwise, the area of the full IC package as shown in Figure A.7 shall be counted as part of the PICC antenna.

Dimensions in millimetres



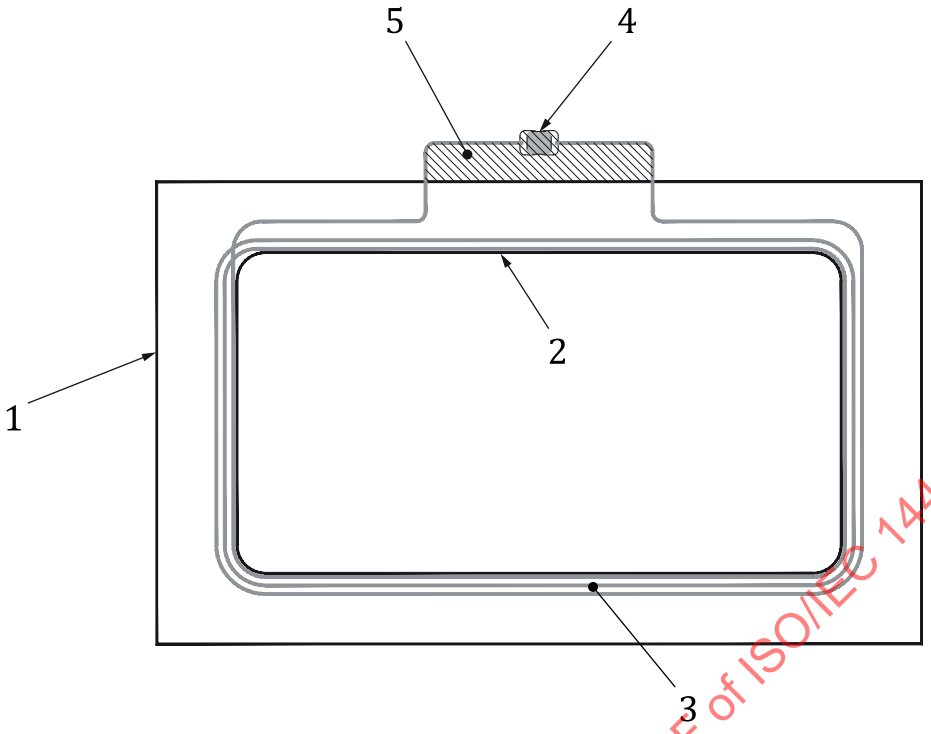
Key

1 PICC antenna zone

Figure A.6 — Location of the antenna of the "Class 6" PICC

A.7 Examples of "Class 1" PICCs

Figure A.7, Figure A.8 and Figure A.9 show examples of "Class 1" PICCs having parts outside of the defined zone.



Key

1 external rectangle of the PICC antenna zone
2 internal rectangle of the PICC antenna zone
3 antenna
4 IC package
5 area A1

Figure A.7 — Example 1 of "Class 1" PICC

NOTE 1 In this example, the PICC antenna fits into a zone which includes area A1 (the connections to the ends of the antenna coil located outside of the defined zone) and which does not differ by more than 300 mm^2 from the PICC antenna zone.