
**Identification Cards — Proximity Cards —
Requirements for the enhancement of
interoperability**

*Cartes d'identification — Cartes de proximité — Exigences pour
l'amélioration de l'interopérabilité*

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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. 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.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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 TR 29123, which is a Technical Report of type 2, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

Introduction

This Technical Report describes requirements for improving the interoperability of proximity cards systems compliant with ISO/IEC 14443. It consists of test functionality based on the ISO/IEC 14443 series and the ISO/IEC 10373-6 test methods standards that may optionally be included in proximity devices in order to improve testability as defined in Annex B. A number of practical tests are then defined.

The contents of this Technical Report may be incorporated into the Revision of ISO/IEC 10373-6, and subsequently may be withdrawn after the publication of ISO/IEC 10373-6 (Revision), expected in 2009.

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Identification Cards — Proximity Cards — Requirements for the enhancement of interoperability

1 Scope

This Technical Report defines a series of requirement and tests used to enhance the interoperability of Proximity cards (PICC) and Proximity coupling devices (PCD) defined in the ISO/IEC 14443 series and tested in accordance with ISO/IEC 10373-6.

Conformance to this Technical Report should increase the chance that the PICCs and PCDs designed to the ISO/IEC 14443 series of standards will be interoperable.

2 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 10373-6:2001, *Identification cards — Test methods — Part 6: Proximity cards*

ISO/IEC 14443-1:2000, *Identification cards — Contactless integrated circuit(s) cards — Proximity cards — Part 1: Physical characteristics*

ISO/IEC 14443-2:2001, *Identification cards — Contactless integrated circuit(s) cards — Proximity cards — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3:2001, *Identification cards — Contactless integrated circuit(s) cards — Proximity cards — Part 3: Initialization and anticollision*

ISO/IEC 14443-4:2001, *Identification cards — Contactless integrated circuit(s) cards — Proximity cards — Part 4: Transmission protocol*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

base standard

ISO/IEC 14443, the standard to which the tests refer

3.2

test method

method for testing the characteristics of PICCs and PCDs for the purpose of assessing their conformance with International Standards

4 Symbols (and abbreviated terms)

For the purposes of this document, the following abbreviations apply:

ATS	Answer to select
DUT	Device under test
EGT	Extra guard time
EOF	End of frame
etu	Elementary time unit
f_c	Carrier frequency (13,56MHz)
FDT	Frame delay time
f_s	Sub-carrier frequency
H_{max}	Maximum field strength of the PCD antenna field
H_{min}	Minimum field strength of the PCD antenna field
PCD	Proximity coupling device
PICC	Proximity integrated circuit card
PPS	Protocol and parameter selection
RATS	Request for answer to select
SOF	Start of frame

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5 General Test Requirements and Conditions

Tests described in this technical report may be performed in any sequence.

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5.1 Test Environment

A proximity card system consists of a PCD and a minimum of one PICC. In order to test either a PCD or PICC, test apparatus is required in order to fulfill the functionality of the other component.

Annex A defines reference test apparatus in order to undertake testing of a proximity device. A reference PCD is required in order to test a PICC, A reference PICC is required to test a PCD. These reference devices have been standardized such that all facilities undertaking the testing defined in this standard can do so in a consistent manner.

Unless otherwise specified, the tests in this technical report shall be applied to PICCs and PCDs defined in ISO/IEC 14443.

5.1.1 Test setup

All cables used to connect apparatus in the test setup should be kept as short as possible, for certain critical cables see the appropriate clause. No metallic objects (or electronic equipment) may be placed within a 30 cm radius of the test setup wherever fields might be affected. Other electromagnetic sources including PCDs, that could influence the test results, shall not be present.

5.1.2 PICC test apparatus

The PICC test apparatus shall be as defined in ISO/IEC 10373-6 with additional functionality as required by further clauses of this document.

5.1.3 PCD test apparatus

The PCD test apparatus shall be as defined in ISO/IEC 10373-6 with additional functionality as required by further clauses of this document.

5.2 Nominal Environment

Unless otherwise specified, to ensure consistent conditions, tests shall be performed within the following nominal environment:

Table 1 — Nominal Environment

Parameter	Value
Temperature	Nominal Temperature of 23 °C ± 3 °C (73 °F ± 5 °F)
Relative humidity	40 % to 60 %

5.3 Definition of PCD Measurement reference point

All tests shall be done over a certain set of points within the manufacturer's defined conformity volume.

The PCD manufacturer shall define a Reference Point as the (0,0,0) point for the X,Y,Z axis and plane where the optimal position on the surface of the PCD for contactless operation is located. When performing tests, all position references given shall be relative to the Reference Point.

X and Y locations shall be in the same plane as the face of the PCD on which the optimal position is located. Height Z shall be calculated perpendicular to the face of the PCD on which the optimal position is located such that:

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For height Z = 0 mm: The DUT antenna shall be placed in contact with the Reference Point.

For height Z = n mm: The DUT antenna shall be placed exactly n mm along the main axis.

6 PCD Power Transfer

6.1 PCD Operating Field Strength

The purpose of this test is to check if the PCD meets the field strength requirements, within its defined conformity volume.

6.1.1 Test Description

The field strength measured under loaded conditions, with the reference PICC, shall be between $H_{\min, \text{PCD}}$ and $H_{\max, \text{PCD}}$ recorded for all measurement positions defined within the defined conformity volume.

The measurement device used for this test shall be the Reference PICC for field and power measurements defined in ISO/IEC 10373-6:2001, Annex D.

Perform the following steps for $H_{\min, \text{PCD}}$:

- 1) Adjust the resonance frequency of the Reference PICC to 13,56 MHz as described in ISO/IEC 10373-6:2001/Amd.2:2003.
- 2) Put the Reference PICC into the Test PCD assembly.

- 3) Adjust the resistor R2 to obtain 3 V (dc) at field strength of $H_{\min, \text{PCD}}$.
- 4) Put the Reference PICC into the measurement positions within the PCD conformity volume.
- 5) For all measurement positions within the PCD conformity volume, the dc voltage at R2 shall be greater or equal to 3 V.

Perform the following steps for $H_{\max \text{PCD}}$:

- 1) Adjust the resonance frequency of the Reference PICC to 19 MHz as described in ISO/IEC 10373-6:2001/Amd.2:2003.
- 2) Put the Reference PICC into the Test PCD assembly.
- 3) Adjust the resistor R2 to obtain 3 V (dc) at field strength of $H_{\max, \text{PCD}}$.
- 4) For all measurement positions within the PCD conformity volume, the dc voltage at R2 shall be less than 3 V.

'Optionally perform the following steps for $H_{\min, \text{PCD}}$ to meet 'Class 1' PICC requirements.

- 1) Adjust the resonance frequency of the Reference PICC to 13,56 MHz as described in ISO/IEC 10373-6:2001/Amd.2:2003.
- 2) Put the Reference PICC into the Test PCD assembly.
- 3) Adjust the resistor R2 to obtain 6 V (dc) at field strength of $H_{\min, \text{PCD}}$.
- 4) Put the Reference PICC into the measurement positions within the PCD Class 1 conformity volume.
- 5) For all measurement positions within the PCD Class 1 conformity volume, the dc voltage at R2 shall be greater or equal to 6V.

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6.1.2 Conditions

Temperature range: As per the manufacturers specification.

6.1.3 Test report

The test report shall include the number of passed tests versus the total number of tests, a test description and the date of the tests.

6.2 Resonant Frequency of PICC (informal only)

No requirement for the resonant frequency of the PICC is currently specified in ISO/IEC 14443.

If this test is performed test procedures as defined in ISO/IEC 10373-6:2001/Amd.2:2003, clause 7.3, should be used.

7 PCD Communication Signal Interface

7.1 Purpose

The PCD modulates the carrier signal used to power the PICC within its defined conformance volume to send data frames. The PICC modulates the carrier signal with a sub-carrier which is used to send responses to the