
Identification cards — Test methods —
Part 6:
Proximity cards

Cartes d'identification — Méthodes d'essai —

Partie 6: Cartes de proximité

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 10373 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 10373-6 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Identification cards and related devices*.

ISO/IEC 10373 consists of the following parts, under the general title *Identification cards — Test methods*:

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- Part 1: *General characteristics tests*
 - Part 2: *Cards with magnetic stripes* [ISO/IEC 10373-6:2001](https://standards.iteh.ai/catalog/standards/sist/b0eeac8e-bbd6-4d08-9880-89dc95cf637/iso-iec-10373-6-2001)
 - Part 3: *Integrated circuit(s) cards with contacts and related interface devices*
 - Part 4: *Close-coupled cards*
 - Part 5: *Optical memory cards*
 - Part 6: *Proximity cards*
 - Part 7: *Vicinity cards*

Annexes A, C and D form a normative part of this part of ISO/IEC 10373. Annexes B, E and F are for information only.

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Identification cards — Test methods —

Part 6: Proximity cards

1 Scope

This International Standard defines test methods for characteristics of identification cards according to the definition given in ISO/IEC 7810. Each test method is cross-referenced to one or more base standards, which may be ISO/IEC 7810 or one or more of the supplementary standards that define the information storage technologies employed in identification cards applications.

NOTE 1 Criteria for acceptability do not form part of this International Standard but will be found in the International Standards mentioned above.

NOTE 2 Test methods described in this International Standard are intended to be performed separately. A given card is not required to pass through all the tests sequentially.

This part of ISO/IEC 10373 deals with test methods which are specific to contactless integrated circuit(s) card technology (Proximity cards). ISO/IEC 10373-1, General characteristics, deals with test methods which are common to one or more ICC technologies and other parts deal with other technology-specific tests.

Unless otherwise specified, the tests in this part of ISO/IEC 10373 shall be applied exclusively to Proximity cards defined in ISO/IEC 14443-1 and ISO/IEC 14443-2.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 10373. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 10373 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 7810:1995, *Identification cards — Physical characteristics*.

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

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

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

IEC 61000-4-2: 1995, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test*.

BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1993, *Guide to the Expression of Uncertainty in Measurement (Gum)*.

3 Terms and definitions, abbreviations and symbols

For the purposes of this part of ISO/IEC 10373, the following terms and definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

base standard

standard which the test method is used to verify conformance to

3.1.2

testably functional

surviving the action of some potentially destructive influence to the extent that any integrated circuit(s) present in the card continues to show a response¹⁾ as defined in ISO/IEC 14443-3 which conforms to the base standard

NOTE If other technologies exist on the same card they shall be testably functional in accordance with their respective standard.

3.1.3

test method

method for testing characteristics of identification cards for the purpose of confirming their compliance with International Standards

3.2 Abbreviations and symbols

DUT Device under test

ESD Electrostatic Discharge

*f*_c Frequency of the operating field

*f*_s Frequency of the subcarrier

*H*_{max} Maximum fieldstrength of the PCD antenna field

*H*_{min} Minimum fieldstrength of the PCD antenna field

PCD Proximity Coupling Device

PICC Proximity Card

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1) This International Standard does not define any test to establish the complete functioning of integrated circuit(s) cards. The test methods require only that the minimum functionality (testably functional) be verified. This may, in appropriate circumstances, be supplemented by further, application specific functionality criteria which are not available in the general case.

4 Default items applicable to the test methods

4.1 Test environment

Unless otherwise specified, testing shall take place in an environment of temperature $23\text{ °C} \pm 3\text{ °C}$ ($73\text{ °F} \pm 5\text{ °F}$) and of relative humidity 40 % to 60 %.

4.2 Pre-conditioning

Where pre-conditioning is required by the test method, the identification cards to be tested shall be conditioned to the test environment for a period of 24 h before testing.

4.3 Default tolerance

Unless otherwise specified, a default tolerance of $\pm 5\%$ shall be applied to the quantity values given to specify the characteristics of the test equipment (e.g. linear dimensions) and the test method procedures (e.g. test equipment adjustments).

4.4 Spurious Inductance

Resistors and capacitors should have negligible inductance.

4.5 Total measurement uncertainty

The total measurement uncertainty for each quantity determined by these test methods shall be stated in the test report.

Basic information is given in Gum, 1993.

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5 Static electricity test

The purpose of this test is to check the behaviour of the card IC in relation to electrostatic discharge (ESD) exposure in the test sample. The card under test is exposed to a simulated electrostatic discharge (ESD, human body model) and its basic operation checked following the exposure.

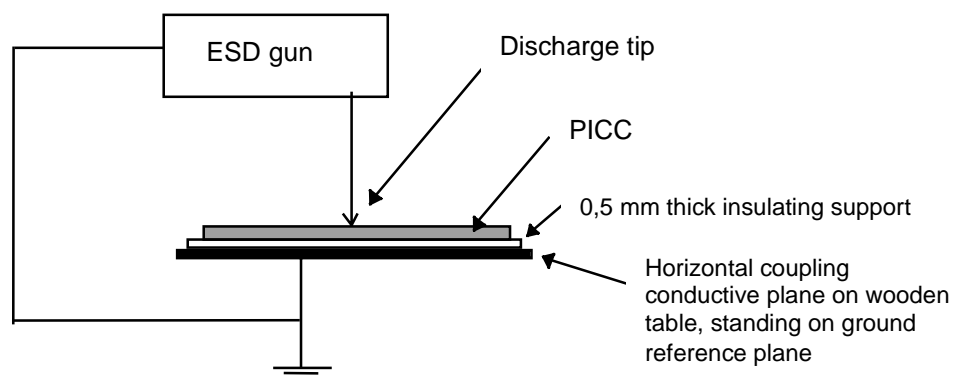


Figure 1 — ESD test circuit

5.1 Apparatus

Refer to IEC 61000-4-2:1995.

- a) Main specifications of the ESD generator
 - energy storage capacitance: 150 pF ± 10 %
 - discharge resistance: 330 Ohm ± 10 %
 - charging resistance: between 50 MOhm and 100 MOhm
 - rise time: 0,7 to 1 ns
- b) Selected specifications from the optional items
 - type of equipment: table top equipment
 - discharge method: direct and contact discharge to the equipment under test
 - discharge electrodes of the ESD generator: Round tip probe of 8 mm diameter (to avoid breaking the surface label layer of card).

5.2 Procedure

Connect the ground pin of the apparatus to the conductive plate upon which the card is placed.

Apply the discharge successively in normal polarity to each of the 20 test zones shown in figure 2. Then repeat the same procedure with reversed polarity. Allow a cool-down period between successive pulses of at least 10 s.

WARNING — If the card includes contacts, the contacts shall be face up and the zone which includes contacts shall not be exposed to this discharge.

Check that the card remains testably functional (see clause 3) at the end of the test.

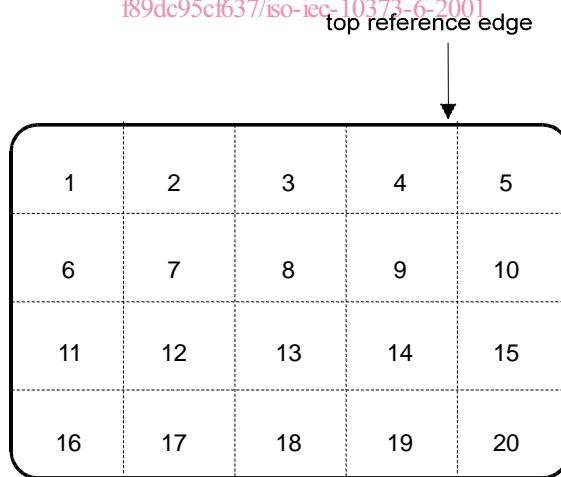


Figure 2 — Test zones on card for ESD test

5.3 Test report

The test report shall state whether or not the card remains testably functional.

6 Test apparatus and test circuits

This clause defines the test apparatus and test circuits for verifying the operation of a PICC or a PCD according to ISO/IEC 14443-2. The test apparatus includes:

- Calibration coil (see 6.1)
- Test PCD assembly (see 6.2)
- Reference PICCs (see 6.3)
- Digital sampling oscilloscope (see 6.4)

These are described in the following clauses.

6.1 Calibration coil

This clause defines the size, thickness and characteristics of the calibration coil.

6.1.1 Size of the Calibration coil card

The calibration coil card shall consist of an area which has the height and width of an ID-1 type defined in ISO/IEC 7810 containing a single turn coil concentric with the card outline.

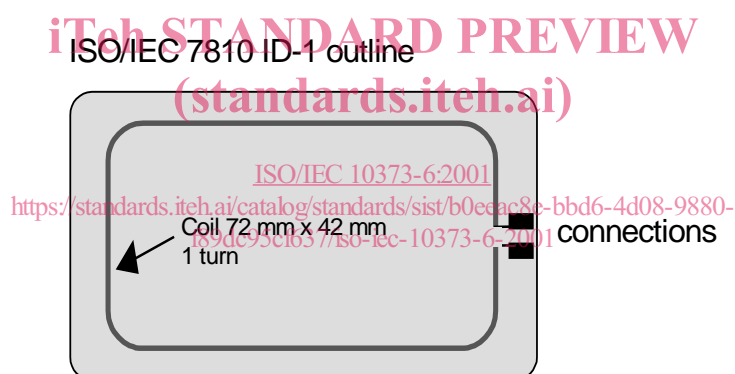


Figure 3 — Calibration coil

6.1.2 Thickness and material of the Calibration coil card

The thickness of the calibration coil card shall be $0,76 \text{ mm} \pm 10 \%$. It shall be constructed of a suitable insulating material.

6.1.3 Coil characteristics

The coil on the calibration coil card shall have one turn. The outer size of the coil shall be $72 \text{ mm} \times 42 \text{ mm}$ with corner radius 5 mm . Relative dimensional tolerance shall be $\pm 2 \%$.

NOTE The area over which the field is integrated is approximately 3000 mm^2 .

The coil shall be made as a printed coil on PCB plated with $35 \text{ }\mu\text{m}$ copper. Track width shall be $500 \text{ }\mu\text{m}$ with a relative tolerance of $\pm 20 \%$. The size of the connection pads shall be $1,5 \text{ mm} \times 1,5 \text{ mm}$.

NOTE At $13,56 \text{ MHz}$ the approximate inductance is 200 nH and the approximate resistance is $0,25 \text{ Ohm}$.

A high impedance oscilloscope probe (e.g. > 1MΩ, < 14pF) shall be used to measure the (open circuit) voltage induced in the coil. The resonance frequency of the calibration coil and connecting leads shall be above 60 MHz.

NOTE A parasitic capacitance of the probe assembly of less than 35 pF normally ensures a resonant frequency for the whole set of greater than 60 MHz.

The open circuit calibration factor for this coil is 0,32 Volts (rms) per A/m (rms). [Equivalent to 900 mV (peak-to-peak) per A/m (rms)]

6.2 Test PCD assembly

The test PCD assembly shall consist of a 150 mm diameter PCD antenna and two parallel sense coils: sense coil a and sense coil b. The test set-up is shown in figure 4. The sense coils shall be connected such that the signal from one coil is in opposite phase to the other. The 50 Ohm potentiometer P1 serves to fine adjust the balance point when the sense coils are not loaded by a PICC or any magnetically coupled circuit. The capacitive load of the probe including its parasitic capacitance shall be less than 14 pF.

NOTE The capacitance of the connections and of the oscilloscope probe should be kept to a minimum for reproducibility.

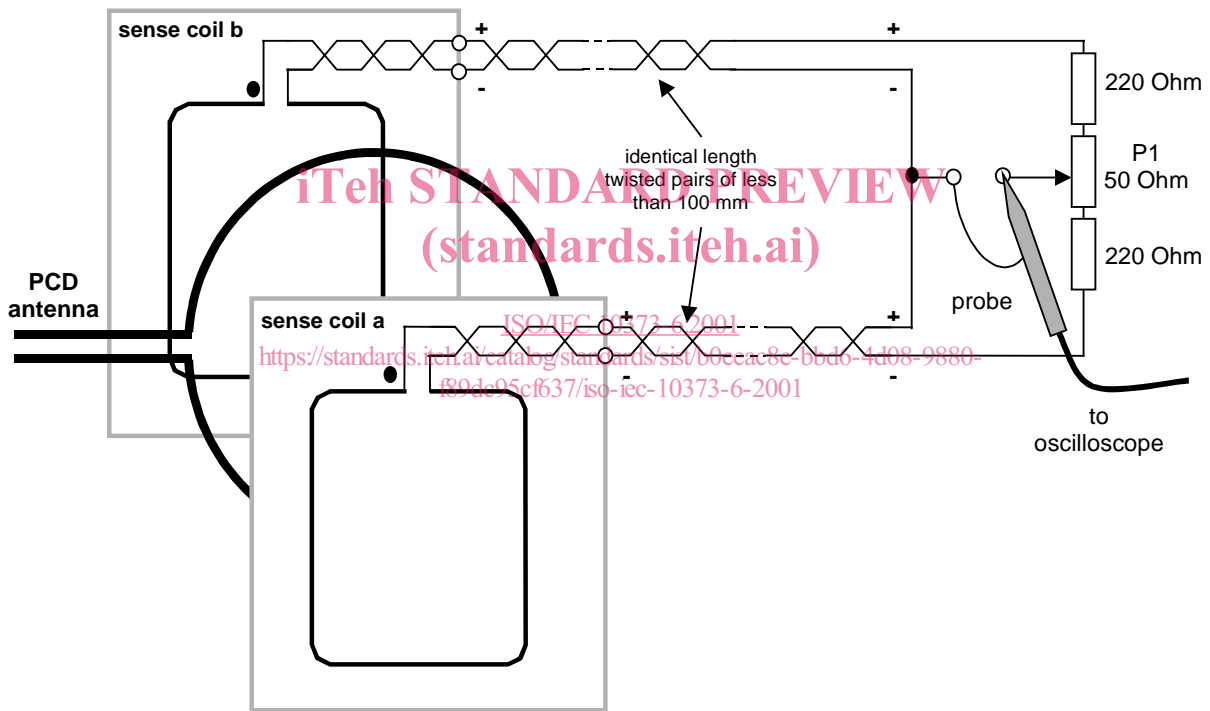


Figure 4 — Test set-up (principle)

6.2.1 Test PCD antenna

The Test PCD antenna shall have a diameter of 150 mm and its construction shall conform to the drawings in Annex A. The tuning of the antenna may be accomplished with the procedure given in Annex B.

6.2.2 Sense coils

The size of the sense coils shall be 100 mm × 70 mm. The sense coil construction shall conform to the drawings in Annex C.