TECHNICAL SPECIFICATION

ISO/IEC TS 24192-2

First edition

Cards and security devices for personal identification — Communication between contactless readers and fare media used in public transport —

Part 2:
Test plan for ISO/IEC 14443 (all parts)

Cartes et dispositifs de sécurité pour l'identification personnelle — Communication entre terminaux et objets sans contact utilisés en transport public —

Partie 2: Plan de test pour l'ISO/IEC 14443 (toutes les parties)

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Foreword

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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 ISO documents 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 or www.iec.ch/members _experts/refdocs).

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

A list of all parts in the ISO/IEC TS 24192 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 and www.iec.ch/national -committees.

Introduction

This test plan represents a necessary step in a process designed to ensure contactless communications interoperability between fare management system terminals and any fare media liable to be accepted by them. The end-purpose of this document is to provide the test conformance plan that needs to be performed to ensure compliancy of fare management system terminals and any fare media in accordance with ISO/IEC TS 24192-1.

This test plan is not designed to repeat or duplicate the referenced specifications and associated test method, essentially ISO/IEC 14443 (all parts) and ISO/IEC 10373-6, but to list the test conditions to be performed in addition to the ones already described in the ISO/IEC 10373-6 and to define their testing and use conditions.

This document comes as a complement to the technical requirements expressed in ISO/IEC TS 24192-1, for ensuring contactless communication interoperability between public transport (PT) devices or between PT devices compliant to ISO/IEC TS 24192-1 and NFC mobiles devices compliant to NFC Forum specifications.

The list of test conditions applicable to the PT device under test is conditioned by the information conformance statement (ICS) declaration made by the device manufacturer. For each test case, the test conditions are clearly specified in order to determine the pertinence to run or not the test case in accordance with the device capabilities or in accordance with the device manufacturer's choice.

In order to facilitate the test report issuance, a test report template is included in Annex A.

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Cards and security devices for personal identification — Communication between contactless readers and fare media used in public transport —

Part 2: Test plan for ISO/IEC 14443 (all parts)

1 Scope

This document lists all the test conditions to be performed on a PT reader or a PT object in order to ensure that all the requirements specified in ISO/IEC TS 24192-1 are met for the PT device under test.

This document applies to PT devices only:

— PT readers which are contactless fare management system terminals acting as a PCD contactless reader based on ISO/IEC 14443 (all parts);

— PT objects which are contactless fare media acting as a PICC contactless object based on ISO/IEC 14443 (all parts).

This document applies solely to the contactless communication layers described in ISO/IEC 14443 (all parts). Application-to-application exchanges executed once contactless communication has been established at RF level fall outside the scope of this document. However, a test application is used to make end-to-end transactions during tests on the RF communication layer.

This document does not duplicate the contents of ISO/IEC 14443 (all parts) or ISO/IEC 10373-6. It makes reference to the ISO/IEC 10373-6 applicable test methods, specifies the test conditions to be used and describes the additional specific test conditions that can be run.

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/TS 24192-1:—, *Cards and security devices for personal identification — Communication between contactless readers and fare media used in public transport — Part 1: Implementation requirements for ISO/IEC 14443 (all parts)*

ISO/IEC 10373-6:2020, *Cards and security devices for personal identification — Test methods — Part 6: Contactless proximity objects*

ISO/IEC 14443-1:2018, *Cards and security devices for personal identification — Contactless proximity objects — Part 1: Physical characteristics*

ISO/IEC 14443-2:2020, *Cards and security devices for personal identification — Contactless proximity objects — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-3:2018, *Cards and security devices for personal identification — Contactless proximity objects — Part 3: Initialization and anticollision*

ISO/IEC 14443-4, *Cards and security devices for personal identification — Contactless proximity objects — Part 4: Transmission protocol*

3   Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC TS 24192-1, ISO/IEC 14443-1, ISO/IEC 14443-2, ISO/IEC 14443-3, ISO/IEC 14443-4 and ISO/IEC 10373-6 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/

4   Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in ISO/IEC TS 24192-1, ISO/IEC 14443-1, ISO/IEC 14443-2, ISO/IEC 14443-3, ISO/IEC 14443-4 and ISO/IEC 10373-6 apply.

5   Description of the test environment

5.1   Test bench

The test bench shall conform to the specifications defined in ISO/IEC 10373-6:2020, Clause 5.

5.2   Tolerances applicable to ambient-environment tests

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The ambient temperature and relative humidity shall conform to the specifications defined in ISO/IEC 10373-6:2020, 4.1. The tolerance for minimum and maximum temperatures is ±3 °C.

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5.3   Test conditions for PCD

Unless otherwise specified:

— test positions and References PICCs as specified in ISO/IEC TS 24192-1:—, 8.2 shall be used;

— the values defined in ISO/IEC 10373-6:2020, Table 4 shall be used to adjust PCD-test-apparatus parameters.

5.4   Test conditions for PICC

Unless otherwise specified:

— the PICC shall be tested with a field strength of H_{min}, 2 A/m, 2,5 A/m, 3,5 A/m, 4,5 A/m, 6 A/m and H_{max};

— the values defined in ISO/IEC 10373-6:2020, Table 7 shall be used to adjust PICC-test-apparatus parameters.

5.5   Positional tolerance

The positional tolerance shall be better than ±1 mm.

5.6   Admissible setup tolerances

Setup tolerances specified in ISO/IEC 10373-6:2020, 4.3 shall be used.

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6 PCD – Test plan

6.1 PCD conformance to ISO/IEC 14443 (all parts)

6.1.1 Tests defined in ISO/IEC 10373-6

Apply ISO/IEC 10373-6:2020, O.1 with the following:

— Alternating magnetic field test (ISO/IEC 10373-6:2020, Table O.8) shall be performed with Reference PICC 1 and Reference PICC 3.

— The minimum field strength specified in ISO/IEC TS 24192-1 for range B shall be used instead of H_{min} for tests performed within range B with Reference PICC 3.

— Modulation index m and waveform test (ISO/IEC 10373-6:2020, Table O.9) shall be performed with:

  — Reference PICC 1 and Reference PICC 2 in Position A1,

  — Reference PICC 3 in Position B1 for IFM readers and Position A1 for common readers,

  — the calibration coil as defined in ISO/IEC 10373-6.

— Phase stability test shall be performed with Reference PICC 1 in Position A1.

— Load modulation reception test (ISO/IEC 10373-6:2020, Table O.9) shall be performed:

  — at ambient temperature, see 5.3;

  — at minimum and maximum temperatures with:

    — Reference PICC 1 in Position A2,

    — Reference PICC 3 in Position B2 for IFM readers and Position A2 for common readers.

— PCD EMD immunity test (ISO/IEC 10373-6:2020, Table O.9) shall be performed with Reference PICC 1 in Position A1 and Position A2.

— Position A1 shall be used for tests defined in ISO/IEC 10373-6:2020, Table O.11 and Table O.12.

6.1.2 RFU bits and values reception test

6.1.2.1 Purpose

This test verifies that the PCD complies with the requirements defined in ISO/IEC 14443 (all parts) on reception of bits and values reserved for future use.

6.1.2.2 Test procedures

Perform the following test procedures.

6.1.2.2.1 Test procedure 1 (ATQA)

Perform the 3 test procedures defined in ISO/IEC 10373-6:2020, H.2.4.3.2, H.2.4.3.3 and H.2.4.3.4, with the following:

— step c), the LT answers with ATQA = 'FFB0' for triple, 'FF70' for double and 'FF30' for single UID size.

6.1.2.2.2 Test procedure 2 (FSCI)

Perform the test procedure defined in ISO/IEC 10373-6:2020, H.2.7.3 with FSCI set to 'D', 'E' and 'F'.

6.1.2.2.3 Test procedure 3 (SFGI, Type A)

Perform the test procedure defined in ISO/IEC 10373-6:2020, H.2.8.3 with the following:

— step c), the LT answers with ATS including interface byte TB(1) equal '0F' indicating SFGI = 15;

— step e), the PCD shall send the first I-block after a minimum delay of ~ 302 µs.

6.1.2.2.4 Test procedure 4 (Maximum Frame Size Code in ATQB)

Perform the test procedure defined in ISO/IEC 10373-6:2020, H.3.2.3 with the following:

— step c), The LT answers with ATQB. For the purpose of this test the LT returns in the second protocol info byte (see ISO/IEC 14443-3:2018, 7.9.4) the Maximum Frame Size Code set to 'D', 'E' and 'F' in ATQB parameter and indicates compliancy with ISO/IEC 14443-4.

6.1.2.2.5 Test procedure 5 (SFGI, Type B)

Perform the test procedure defined in ISO/IEC 10373-6:2020, H.3.2.3 with the following:

— step b), check if the extended ATQB option is supported or not by the PCD (bit 5 of REQB/WUPB PARAM byte);

— step c), if the extended ATQB option is supported by the PCD then the LT answers with ATQB including the optional Extended ATQB byte (optional 4th byte of protocol info field) indicating SFGI = 15;

— step h), the PCD shall send the first I-block after a minimum delay of ~ 302 µs.

6.1.2.2.6 Test procedure 6 (Protocol_Type, Type B)

Place the LT into the PCD operating volume and record the presence and the content of the PCD commands.

Use the following sequence:

a) The UT performs the activation procedure according to ISO/IEC 10373-6:2020, H.1.9.1.

b) The LT waits until the PCD sends the REQB/WUPB command.

c) The LT sends ATQB with Protocol_Type bit b4 set to (1)b.

d) The LT checks that the PCD does not continue communicating.

6.1.2.2.7 Test procedure 7 (WTXM)

After the protocol activation procedure in accordance with ISO/IEC 10373-6:2020, H.1.9.2 for Type A or ISO/IEC 10373-6:2020, H.1.9.3 for Type B using FWI = 1, perform the test procedure defined in ISO/IEC 10373-6:2020, H.4.3.3 with WTXM set to 0, 60 and 63.

6.1.2.2.8 Test procedure 8 (FWI)

After the protocol activation procedure in accordance with ISO/IEC 10373-6:2020, H.1.9.2 for Type A or ISO/IEC 10373-6:2020, H.1.9.3 for Type B using FWI = 15, perform the test procedure defined in ISO/IEC 10373-6:2020, H.4.3.3 with WTXM set to 1, 3 and 59.

6.1.2.2.9 Test procedure 9 (Bit_Rate_capability)

Perform the test procedure defined in ISO/IEC 10373-6:2020, I.3.2 with Bit_Rate_capability byte set to 'FF'.

6.1.2.3 Test report

The test report shall state whether the PCD complies with the requirements defined in ISO/IEC 14443 (all parts) on reception of bits and values reserved for future use.

Fill the appropriate row in Table A.1 in accordance with Table 1.

Table 1 — Result criteria for RFU bits and values reception test

Explanation	Test result
Only when the PCD complies with ISO/IEC 14443 (all parts) requirements on reception of bits and values reserved for future use in each of the test procedures	PASS
Any other case	FAIL

6.2 PCD conformance to ISO/IEC TS 24192-1

6.2.1 AFI value sent by the PCD

6.2.1.1 Purpose

This test verifies that the PCD uses an AFI of '00' in at least one REQB/WUPB command in its polling sequence as defined in ISO/IEC TS 24192-1:—, 8.2 [Rdr4].

6.2.1.2 Test procedure

Perform the test procedure defined in 6.2.3.2 to verify that the PCD uses an AFI of '00' in at least one REQB/WUPB command in its polling sequence.

6.2.1.3 Test report

The test report shall state whether the PCD was using an AFI of '00' in at least one REQB/WUPB command in its polling sequence.

Fill the appropriate row in Table A.1 in accordance with Table 2.

Table 2 — Result criteria for AFI value sent by the PCD test

Explanation	Test result
Only when the PCD uses an AFI of '00' in at least one REQB/WUPB command in its polling sequence	PASS
Any other case	FAIL

6.2.2 PCD Type A time-to-detection

6.2.2.1 Purpose

This test verifies that the PCD detects and selects a Type A Reference PICC entering the field and indicating no SFGT needed, in less than t_{detect} on average, regardless of the moment when the Reference PICC is placed within range A or B of the contactless reader. t_{detect} value is defined in ISO/IEC TS 24192-1:—, 8.3 [Rdr5].

6.2.2.2 Test procedure

For apparatus, see ISO/IEC 10373-6:2020, H.1.

Place the LT into the PCD operating volume and record the presence and the content of the PCD commands.

Use the following sequence:

a) The UT performs the activation procedure according to ISO/IEC 10373-6:2020, H.1.9.1.

b) The LT is disabled (not sending any response) until the start of timing measurement. If the polling cycle is continuous, the start of timing measurement is a point of time randomly chosen, independently from the PCD polling cycle. If the polling cycle is not continuous, the start of timing measurement is the moment when the polling cycle starts. When enabled, the LT answers to the first valid REQA/WUPA command.

c) The LT answers relevant anticollision messages and waits until the PCD sends a valid RATS command.

d) The LT answers with a valid ATS using FDT less than 1 ms. This maximum timing also applies to PPS response in case the PCD sends a PPS command.

e) The UT sends the SEND_UT_APDU(UT_TEST_COMMAND2) to the PCD where the data length shall be more than the maximum size of a frame accepted by the LT. If the UT interface delay is not negligible, it may be subtracted from the measurement.

f) The PCD shall send an $I(1)_0$ block with its maximum length in accordance with FSCI. The end of timing measurement corresponds to the beginning of the frame containing this $I(1)_0$ block.

g) Repeat at least 10 times to get the average value for the Reference PICC time-to-detection.

6.2.2.3   Test report

The test report shall give the average value for the Type A Reference PICC time-to-detection.

Fill the appropriate row in Table A.1 in accordance with Table 3.

Table 3 — Result criteria for PCD Type A time-to-detection test

Explanation	Test result
Only when the average duration between the moment when the Type A Reference PICC is enabled and the beginning of the first I-block sent by the PCD is less than t_{detect}	PASS
Any other case	FAIL

6.2.3   PCD Type B time-to-detection

6.2.3.1   Purpose

This test verifies that the PCD detects and selects a Type B Reference PICC entering the field and indicating no SFGT needed, in less than t_{detect} on average, regardless of the moment when the Reference PICC is placed within range A or B of the contactless reader. t_{detect} value is defined in ISO/IEC TS 24192-1:—, 8.3 [Rdr5].

6.2.3.2   Test procedure

For apparatus, see ISO/IEC 10373-6:2020, H.1.

Place the LT into the PCD operating volume and record the presence and the content of the PCD commands.

Use the following sequence:

a) The UT performs the activation procedure according to ISO/IEC 10373-6:2020, H.1.9.1.

b) The LT is disabled (not sending any response) until the start of timing measurement. If the polling cycle is continuous, the start of timing measurement is a point of time randomly chosen,