SLOVENSKI STANDARD
SIST-TS CEN/TS 16794-2:2015

01-september-2015

Javni prevoz - Komunikacija med brezkontaktnimi čitalniki/terminali in prevoznimi mediji - 2. del: Načrt za preskus po ISO/IEC 14443

Public transport - Communication between contactless readers and fare media - Part 2: Test plan for ISO/IEC 14443

Öffentlicher Verkehr - Kommunikation zwischen berührungslosen Lesegeräten und Fahrschein Medien - Teil 2: Prüfplan zur ISO/IEC 14443

Transport Public - Système billettique interopérable - Communication entre terminaux et objets sans contact - Partie 2 : Plan de test pour l’ISO/IEC 14443

Ta slovenski standard je istoveten z: **CEN/TS 16794-2:2015**

ICS:

03.220.01	Transport na splošno	Transport in general
35.240.60	Uporabniške rešitve IT v transportu in trgovini	IT applications in transport and trade

SIST-TS CEN/TS 16794-2:2015 **en,fr,de**

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN/TS 16794-2

April 2015

ICS 35.240.15

English Version

Public transport - Communication between contactless readers and fare media - Part 2: Test plan for ISO/IEC 14443

Transport Public - Système billettique interopérable - Communication entre terminaux et objets sans contact - Partie 2: Plan de test pour l'ISO/IEC 14443

Öffentlicher Verkehr - Kommunikation zwischen berührungslosen Ladegeräten und Fahrscheinmedien - Teil 2: Prüfplan zur ISO/IEC 14443

This Technical Specification (CEN/TS) was approved by CEN on 24 February 2015 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. CEN/TS 16794-2:2015 E

Contents

Page

Foreword

This document (CEN/TS 16794-2:2015) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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 to CEN/TS 16794-1, *Public transport - Communication between contactless readers and fare media - Part 1: Implementation requirements for* ISO/IEC 14443.

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

This test plan includes the following key clauses:

- Clause 5 describes the test environment;
- Clause 6 sets out the analog test plan for fare management system terminals;
- Clause 7 sets out the analog test plan for contactless fare media;
- Clause 8 sets out the protocol and digital test plan for fare management system terminals;
- Clause 9 sets out the protocol and digital test plan for contactless fare media.

1 Scope

This Technical Specification comes as a complement to the technical requirements expressed in CEN/TS 16794-1, *Public transport - Communication between contactless readers and fare media - Part 1: Implementation requirements for* ISO/IEC 14443, for ensuring contactless communication interoperability between contactless fare management system terminals and contactless fare media hosting a transport ticketing application.

This test plan lists all the test conditions to be performed on a contactless reader or a contactless fare media in order to ensure that all the requirements specified in CEN/TS 16794-1 are met for the device under test.

This Technical Specification is then applicable to:

— any **contactless fare management system terminals** acting as a PCD **contactless reader** based on ISO/IEC 14443-series standards;

— any **contactless fare media** acting as a PICC **contactless object** based on ISO/IEC 14443-series standards.

This test plan applies solely to the contactless communication layers described in parts 1 to 4 of the ISO/IEC 14443- series of standards. Application-to-application exchanges executed once contactless communication has been established at RF level fall outside the scope of this test plan. However, a transport ticketing application will need to be used so as to make end-to-end transactions during tests on the RF communication layer.

This test plan does not duplicate the contents of ISO/IEC 14443- series or ISO/IEC 10373-6 standards. It makes reference to the ISO/IEC 10373-6 applicable tests methods, specifies the test conditions to be used and describes the additional specific test conditions that may be run.

The list of test conditions applicable to the device under test will be 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 of the present test plan.

Although the present test plan aims at becoming the primary basis for certification of contactless communication protocol between contactless reader and contactless object, it does not describe any certification or qualification processes as such processes should be defined between local or global transit industry stakeholders and not within this CEN work group.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10373-6:2011, *Identification cards — Test methods — Part 6: Proximity cards*

ISO/IEC 10373-6:2011/Amd.1:2012, *Identification cards — Test methods — Part 6: Proximity cards / Amendment 1: Additional PICC classes*

ISO/IEC 10373-6:2011/Amd.2:2012, *Identification cards — Test methods — Part 6: Proximity cards / Amendment 2: Test methods for electromagnetic disturbance*

ISO/IEC 10373-6:2011/Amd.3:2012, *Identification cards — Test methods — Part 6: Proximity cards / Amendment 3: Exchange of additional parameters, block numbering, unmatched AFI and TR2*

ISO/IEC 10373-6:2011/Amd.4:2012, *Identification cards — Test methods — Part 6: Proximity cards / Amendment 4: Bit rates of fc/8, fc/4 and fc/2 and frame size from 512 to 4096 bytes*

ISO/IEC 10373-6:2011/Cor:2013, *Identification cards — Test methods — Part 6: Proximity cards / R2 value range, start of PICC transmission and program for EMD level measurement*

ISO/IEC 14443-1:2008, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 1: Physical characteristics*

ISO/IEC 14443-1:2008/Amd.1:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 1: Physical characteristics / Amendment 1: Additional PICC classes*

ISO/IEC 14443-2:2010, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface*

ISO/IEC 14443-2:2010/Amd.1:2011, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface / Amendment 1: Limits of electromagnetic disturbance levels parasitically generated by the PICC*

ISO/IEC 14443-2:2010/Amd.2:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface / Amendment 2: Additional PICC classes*

ISO/IEC 14443-2/Amd.3:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 2: Radio frequency power and signal interface / Amendment 3: Bits rates of fc/8, fc/4 and fc/2*

ISO/IEC 14443-3:2011, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision*

ISO/IEC 14443-3:2011/Amd.1:2011, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision / Amendment 1: Electromagnetic disturbance handling and single-size unique identifier*

ISO/IEC 14443-3:2011/Amd.2:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 3: Initialization and anticollision / Amendment 2: Bit rates of fc/8, fc/4 and fc/2, frame size from 512 bytes to 4 096 bytes and minimum TR0*

ISO/IEC 14443-4:2008, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol*

ISO/IEC 14443-4:2008/Amd.1:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol / Amendment 1: Exchange of additional parameters*

ISO/IEC 14443-4:2008/Amd.2:2012, *Identification cards — Contactless integrated circuit cards — Proximity cards — Part 4: Transmission protocol / Amendment 2: Bit rates of fc/8, fc/4 and fc/2, protocol activation of PICC Type A and frame size from 512 bytes to 4 096 bytes*

CEN/TS 16794-1:2015, *Public transport — Communication between contactless readers and fare media — Part 1: Implementation requirements for ISO/IEC 14443*

3 Terms and definitions

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

3.1
Reference PICC
Reference PICC card as defined in test method ISO/IEC 10373-6:2011

4 Symbols and abbreviations

The following abbreviated terms are used in this document.

AFI	Application Family Identifier, Type B
ATQA	Answer To Request, Type A
ATQB	Answer To Request, Type B
FWI	Frame Waiting time Integer
FSCI	Frame Size for proximity Card Integer
PCD	Proximity Coupling Device
PICC	Proximity IC Card
PUPI	Pseudo-Unique PICC Identifier, Type B
REQA	Request Command, Type A
REQB	Request Command, Type B
RF	Radio Frequency
SFGT	Start-up Frame Guard Time
UID	Unique Identifier, Type A
WUPA	Wake-UP Command, Type A
WUPB	Wake-UP Command, Type B

5 Description of the test environment

5.1 Test bench

The test bench shall conform to the specifications set out in Clause 5 of ISO/IEC 10373-6:2011 and ISO/IEC 10373-6:2011/Amd.2:2012.

5.2 Tolerances applicable to ambient-environment tests

Parameter	**Unit**	**Absolute tolerance**
Temperature	Degrees Celsius (°C)	± 3 °C
Relative humidity	Percentage (%)	± 5 %

5.3 PCD or PICC test conditions

Parameter	**Unit**	**Value**
Temperature	Degrees Celsius (°C)	Minimum Temperature and Ambient Temperature and Maximum Temperature

5.4 Positional tolerance

Parameter	Unit	Tolerance
PICC-to-PCD distance	Millimetres (mm)	± 1 mm, except at 0

5.5 Admissible tolerances on the measurements

Tolerances specified in ISO/IEC 10373-6:2011 shall be applied.

NOTE Different tolerances for some parameters are being standardized in a draft amendment to ISO/IEC 10373-6:2011.

6 PCD – Analog test plan

6.1 PCD general test conditions

Unless otherwise specified, each test shall be executed:

- with Reference PICCs 1, 2 and 3 at every position of range A (Position A1 to A5),
- with Reference PICC 3 at every position of range B (Position B1 to B3),

which makes a total of 18 test conditions.

For Common Readers, the range A is limited from position A1 to A2 and the range B is limited from position B1 to B2. Consequently, for common readers, tests specified in several positions of range A and of range B shall be done only in positions A1, A2, B1 and B2.

As specified in CEN/TS 16794-1:2015, 9.2.3.2, if the measurements cannot be taken from Position A1 then the measurements shall be taken from Position A1' where the Reference PICC is in contact with the PCD device under test.

As specified in CEN/TS 16794-1:2015, 9.2.3.4, if the measurements cannot be taken from Position B1 then the measurements shall be taken from Position B1' where the Reference PICC is in contact with the PCD device under test.

6.2 Conformance of the PCD field strength

6.2.1 General

The maximum and minimum PCD field strength tests shall be done during an interval of time when the PCD produces a field. One possibility is to use an oscilloscope and measure the field strength during the interval of time preceding a request or wake-up command. If the PCD under test provides a specific "continuous unmodulated field" mode, another possibility is to use a voltmeter.

6.2.2 TC_PCD_A_MaxFS: PCD maximum field strength

6.2.2.1 Scope / purpose

This test verifies the maximum magnetic field strength in the PCD operating volume (range A and range B).

6.2.2.2 Test conditions

At ambient, minimum and maximum temperatures, Reference PICCs 1, 2 and 3 within range A and Reference PICC 3 within range B.

6.2.2.3 Test procedure

Perform the procedure for H_{max} test defined in ISO/IEC 10373-6:2011, 7.1.1.2 by moving the Reference PICCs in all the positions of the PCD operating volume defined in 6.2.2.2.

6.2.2.4 Test report

The test report shall give the maximum DC voltage measured at CON3 under the conditions applied.

Fill the TC_PCD_A_MaxFS row of test plan summary in accordance with the following table:

Table 1 — Result criteria for maximum PCD field strength test

Explanation	**Test result**
Only when the DC voltages at CON3 does not exceed 3 V in all 12 test conditions	PASS
When the DC voltages at CON3 exceeds 3 V in at least one of the 12 test conditions	FAIL

6.2.3 TC_PCD_A_ MinFS : PCD minimum field strength

6.2.3.1 Scope / purpose

This test verifies the minimum magnetic field strength in the PCD operating volume (range A and range B).

6.2.3.2 Test conditions

At ambient, minimum and maximum temperatures, Reference PICCs 1, 2 and 3 within range A and Reference PICC 3 within range B.

6.2.3.3 Test procedure

Perform the procedure for H_{min} test defined in ISO/IEC 10373-6:2011, 7.1.1.2 (amended by ISO/IEC 10373-6:2011/Amd.1:2012) by moving the Reference PICCs in all the positions of the PCD operating volume defined in 6.2.3.2.

In addition, perform the previous procedure, using the minimum field strength specified for range B instead of H_{min}, by moving the Reference PICC 3 in all the positions of range B.

6.2.3.4 Test report

The test report shall give the minimum DC voltage measured at CON3 under the conditions applied.

Fill the TC_PCD_A_ MinFS row of test plan summary in accordance with the following table:

Table 2 — Result criteria for minimum PCD field strength test

Explanation	**Test result**
Only when the DC voltages at CON3 exceeds V_{load} as defined in ISO/IEC 10373-6:2011/Amd.1:2012, Table 3 in all 12 test conditions	PASS
When the DC voltages at CON3 does not exceed V_{load} as defined in ISO/IEC 10373-6:2011/Amd.1:2012, Table 3 in at least one of the 12 test conditions	FAIL

6.3 Conformance of the PCD modulation waveform

6.3.1 TC_PCD_A_TAMW: Type A modulation waveform

6.3.1.1 Scope / purpose

This test verifies the Type A modulation waveform in the PCD operating volume (range A and range B).

6.3.1.2 Test conditions

At ambient, minimum and maximum temperatures, Reference PICCs 1 and 2 in Position A1, Reference PICC 3 in Position B1 and the calibration coil at an arbitrary position.

6.3.1.3 Test procedure

Perform the test procedure defined in ISO/IEC 10373-6:2011, 7.1.4.2 (amended by ISO/IEC 10373-6:2011/Amd.1:2012) for all the positions of the PCD operating volume defined in 6.3.1.2 and for all supported PCD to PICC bit rates.

6.3.1.4 Test report

The test report shall give the measured Type A modulation pulse, rise and fall times and overshoot values under the conditions applied.

Fill the TC_PCD_A_TAMW row of test plan summary in accordance with the following table for all supported PCD to PICC bit rates.

Table 3 — Result criteria for Type A modulation waveform test

Explanation	Test result
Only when the Type A modulation pulse, rise and fall times and overshoot values are compliant in all 12 test conditions	PASS
When at least one value is not compliant in at least one of the 12 test conditions	FAIL

6.3.2 TC_PCD_A_TBMW: Type B modulation index and waveform

6.3.2.1 Scope / purpose

This test verifies the Type B modulation index and the waveform in the PCD operating volume (range A and range B).

6.3.2.2 Test conditions

At ambient, minimum and maximum temperatures, Reference PICCs 1 and 2 in Position A1, Reference PICC 3 in Position B1 and the calibration coil at an arbitrary position.

6.3.2.3 Test procedure

Perform the test procedure defined in ISO/IEC 10373-6:2011, 7.1.4.2 (amended by ISO/IEC 10373-6:2011/Amd.1:2012) for all the positions of the PCD operating volume defined in 6.3.2.2 and for all supported PCD to PICC bit rates.

6.3.2.4 Test report

The test report shall give the measured type B modulation index, rise and fall times and overshoot values under the conditions applied.

Fill the TC_PCD_A_TBMW row of test plan summary in accordance with the following table for all supported PCD to PICC bit rates.

Table 4 — Result criteria for Type B modulation index and waveform test

Explanation	Test result
Only when the Type B modulation index, rise and fall times and overshoot values are compliant in all 12 test conditions	PASS
When at least one value is not compliant in at least one of the 12 test conditions	FAIL

6.4 Conformance of the PCD load modulation reception

6.4.1 TC_PCD_A_TALMR: Type A load modulation reception

6.4.1.1 Scope / purpose

This test verifies the Type A load modulation reception in the PCD operating volume (range A and range B).

6.4.1.2 Test conditions

At ambient temperature, see 6.1.

At minimum and maximum temperatures, only Reference PICC 1 in Position A2 and Reference PICC 3 in Position B2.

6.4.1.3 Test procedure

Perform the test procedure defined in ISO/IEC 10373-6:2011, 7.1.5.2 (amended by ISO/IEC 10373-6:2011/Amd.1:2012) in all the defined positions of the PCD operating volume and for all supported PICC to PCD bit rates, except bit rates of fc/64 (~212 kbit/s), fc/32 (~424 kbit/s) and fc/16 (~848 kbit/s).

6.4.1.4 Test report

The test report shall give the PCD Type A load modulation sensitivity under the conditions applied.

Fill the TC_PCD_A_TALMR row of test plan summary in accordance with the following table for all supported PICC to PCD bit rates.

Table 5 — Result criteria for Type A load modulation reception test

Explanation	Test result
Only when the PCD Type A load modulation sensitivity is below the standard limit in all 44 test conditions	PASS
When the PCD Type A load modulation sensitivity is above the standard limit in at least one of the 44 test conditions	FAIL