INTERNATIONAL STANDARD

ISO/IEC 14443-2

Second edition
2010-09-01

AMENDMENT 2
2012-08-01

Identification cards — Contactless integrated circuit cards — Proximity cards —

Part 2: Radio frequency power and signal interface

AMENDMENT 2: Additional PICC classes

Cartes d'identification — Cartes à circuit(s) intégré(s) sans contact — Cartes de proximité —

Partie 2: Interface radiofréquence et des signaux de communication

AMENDEMENT 2: Classes additionnelles de PICC

Reference number
ISO/IEC 14443-2:2010/Amd.2:2012(E)

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Foreword

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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.

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.

Amendment 2 to ISO/IEC 14443-2:2010 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

Identification cards — Contactless integrated circuit cards — Proximity cards —

Part 2:
Radio frequency power and signal interface

AMENDMENT 2: Additional PICC classes

Page 1, Normative references

Add publication date to ISO 14443-1 as follows:

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

Page 2, Clause 3

Add the following definition and renumber all subsequent definitions:

3.6
operating volume
for each PICC class, the positions where the corresponding Reference PICC shows PCD compliance with all requirements of this International Standard for this class

Page 3, Clause 4

Add the following symbols and definitions:

$V_{LMA,\ PCD}$ Minimum load modulation amplitude for PCD reception

$V_{LMA,\ PICC}$ Minimum load modulation amplitude for PICC transmission

Page 3, Clause 5

Replace Clause 5 by the following:

5 General considerations

5.1 Initial dialogue

The initial dialogue between the PCD and the PICC shall be conducted through the following consecutive operations:

— activation of the PICC by the RF operating field of the PCD,

— the PICC shall wait silently for a command from the PCD,

— transmission of a command by the PCD,

— transmission of a response by the PICC.

These operations shall use the RF power and signal interface specified in the following clauses.

5.2 Compliance

5.2.1 PICC compliance

The PICC shall comply with all mandatory requirements of this International Standard and may support optional requirements (bit rate, class…). The PICC should fulfill all the requirements of one particular class in order to improve interoperability.

5.2.2 PCD compliance

The PCD shall comply with all mandatory requirements of this International Standard and may support optional requirements (bit rate, support of PICCs of optional classes…).

The PCD

— shall support PICCs of “Class 1”, “Class 2” and “Class 3”,

— may optionally support PICCs of “Class 4”,

— may optionally support PICCs of “Class 5”,

— and may optionally support PICCs of “Class 6”.

PCD requirements measured with Reference PICCs 1, 2 and 3 are mandatory for all PCDs.

PCD requirements measured with Reference PICC 4 are only mandatory for PCDs supporting operation with “Class 4” PICCs.

PCD requirements measured with Reference PICC 5 are only mandatory for PCDs supporting operation with “Class 5” PICCs.

PCD requirements measured with Reference PICC 6 are only mandatory for PCDs supporting operation with “Class 6” PICCs.

For each supported PICC class, the PCD manufacturer shall indicate the operating volume within which the PCD fulfils all requirements of this International Standard.

NOTE As an indication of each operating volume, the manufacturer may give the operating range (e.g. 0 to X cm with PCD and PICC relative positions, e.g. PCD and PICC antennas parallel and concentric).

5.2.2.1 PCD supporting PICCs of particular class(es)

If a PCD is expected to operate with PICCs of only particular class(es), it is not mandatory for this PCD to support PICCs of other classes. This PCD shall comply with all other relevant clauses of this International Standard. The PCD manufacturer shall clearly state which class(es) are supported.

NOTE A PCD which does not support one of the mandatory classes 1, 2 and 3 is not fully compliant with 14443-2. It may be advertised as “supporting “Class X” PICCs only” or “compliant with Class(es) X requirements only”.

Page 4, Clause 6

Replace 6.2 by the following subclause:

6.2 Operating field strength

Within the manufacturer specified operating volumes (see 3.6), the PCD shall generate a field strength of at least H_{min} and not exceeding H_{max} under unmodulated conditions.

The PCD

— shall support PICCs of “Class 1”, “Class 2” and “Class 3”,

— may optionally support PICCs of “Class 4”,

— may optionally support PICCs of “Class 5”,

— and may optionally support PICCs of “Class 6”.

PCD requirements measured with Reference PICCs 1, 2 and 3 are mandatory for all PCDs.

PCD requirements measured with Reference PICC 4 are only mandatory for PCDs supporting operation with “Class 4” PICCs.

PCD requirements measured with Reference PICC 5 are only mandatory for PCDs supporting operation with “Class 5” PICCs.

PCD requirements measured with Reference PICC 6 are only mandatory for PCDs supporting operation with “Class 6” PICCs.

Table 1 — PCD field strength

	PCD	
	H_{min} A/m (rms)	H_{max} A/m (rms)
Measured with Reference PICC 1	1,5	7,5
Measured with Reference PICC 2	1,5	8,5
Measured with Reference PICC 3	1,5	8,5
Measured with Reference PICC 4 (optional)	2,0	12
Measured with Reference PICC 5 (optional)	2,5	14
Measured with Reference PICC 6 (optional)	4,5	18

The PCD shall not generate a field strength higher than the average and maximum levels specified for all mandatory and optional classes in ISO/IEC 14443-1:2008/Amd.1:2012, 4.4 (alternating magnetic field) in any possible PICC position and orientation, measured with the associated Reference PICCs.

Test methods for the PCD operating field are defined in ISO/IEC 10373-6 and use a dedicated Reference PICC for each class.

NOTE 1 Although field measurements with some Reference PICCs may show values higher than 7,5 A/m (rms), the new H_{max} limits specified in Table 1 do not allow PCDs to produce higher field strength than with first edition of ISO/IEC 14443-2. This is because PCD field distribution is usually not homogenous within the operating volumes and References PICCs have different measurement areas.

If the PICC meets the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then the PICC shall operate as intended continuously between H_{min} and H_{max} defined for its class; this includes all PICC requirements defined in this International Standard and processing of the manufacturer specified set of commands.

If the PICC does not claim to meet the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then:

— if the PICC antenna fits within the external rectangle defined in “Class 2” as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then:

  — the PICC shall operate as intended continuously between H_{min} and H_{max} defined for “Class 2”,

  - the PICC shall pass the loading effect test defined for “Class 2”;

- if the PICC antenna fits within the external rectangle or external circle defined in “Class 3” as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then:
  - the PICC shall operate as intended continuously between H_{min} and H_{max} defined for “Class 3”,
  - the PICC shall pass the loading effect test defined for “Class 3”;
- if the PICC antenna does not claim to fit within the external rectangle or external circle defined in “Class 2” or “Class 3” as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then:
  - the PICC shall operate as intended continuously between H_{min} and H_{max} defined for “Class 1”,
  - the PICC shall pass the loading effect test defined for “Class 1”.

NOTE 2 If the PICC does not claim to meet the requirements of one particular class then the requirements defined above may not be sufficient to guarantee proper operation and interoperability with PCDs.

Table 2 — PICC operating field strength

	PICC	
	H_{min} A/m (rms)	H_{max} A/m (rms)
“Class 1” PICC	1,5	7,5
“Class 2” PICC	1,5	8,5
“Class 3” PICC	1,5	8,5
“Class 4” PICC	2,0	12
“Class 5” PICC	2,5	14
“Class 6” PICC	4,5	18

NOTE 3 Margins of field strength are effectively included by the test methods as specified in ISO/IEC 10373-6.

Page 4, Clause 7

Replace the 3rd paragraph with:

“Within the manufacturer specified operating volumes (see 3.6), the PCD shall generate modulation pulses as described in the following clauses and shall be capable of receiving the minimum load modulation amplitude.”

Page 15, 8.2

Replace 8.2.2 by the following subclause and renumber all subsequent tables and figures:

8.2.2 Load modulation

The PICC shall be capable of communication to the PCD via an inductive coupling area where the carrier frequency is loaded to generate a subcarrier with frequency *fs*. The subcarrier shall be generated by switching a load in the PICC.

If the PICC meets the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then the load modulation amplitude V_{LMA} of the PICC shall be at least $V_{LMA,\ PICC}$ specified for its class when measured as described in ISO/IEC 10373-6, using the test PCD assembly defined for its class, where *H* is the value of magnetic field strength in A/m (rms).

If the PICC does not claim to meet the requirements of one particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then the load modulation amplitude V_{LMA} of the PICC shall be at least

$V_{LMA,\ PICC}$ specified for “Class 1” when measured as described in ISO/IEC 10373-6, using the test PCD assembly defined for “Class 1”, where H is the value of magnetic field strength in A/m (rms).

Table 8 specifies for each PICC class both the load modulation amplitude limit $V_{LMA,\ PICC}$ and the relevant test PCD assembly to measure the PICC load modulation amplitude V_{LMA}.

Table 8 — PICC load modulation amplitude limit

	PICC	
	$V_{LMA,\ PICC}$ [mV (peak)]	**Test PCD assembly**
“Class 1” PICC	$22/H^{0,5}$	Test PCD assembly 1
“Class 2” PICC	$\text{Min}(14 ; 22/H^{0,5})$	Test PCD assembly 1
“Class 3” PICC	$\text{Min}(14 ; 22/H^{0,5})$	Test PCD assembly 1
“Class 4” PICC	$\text{Min}(18 ; 40/H^{0,5})$	Test PCD assembly 2
“Class 5” PICC	$\text{Min}(14 ; 34/H^{0,5})$	Test PCD assembly 2
“Class 6” PICC	$\text{Min}(7 ; 26/H^{0,5})$	Test PCD assembly 2

The PCD shall be able to receive a V_{LMA} of at least $V_{LMA,\ PCD}$ when measured as described in ISO/IEC 10373-6, using test PCD assembly 1, with Reference PICCs 1, 2 and 3, where H is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with “Class 4” PICCs, it shall be able to receive a V_{LMA} of at least $V_{LMA,\ PCD}$ when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 4, where H is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with “Class 5” PICCs, it shall be able to receive a V_{LMA} of at least $V_{LMA,\ PCD}$ when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 5, where H is the value of magnetic field strength in A/m (rms).

If the PCD supports operation with “Class 6” PICCs, it shall be able to receive a V_{LMA} of at least $V_{LMA,\ PCD}$ when measured as described in ISO/IEC 10373-6, using test PCD assembly 2, with Reference PICC 6, where H is the value of magnetic field strength in A/m (rms).

Table 9 specifies for each Reference PICC both the load modulation reception limit $V_{LMA,\ PCD}$ and the test PCD assembly to use to measure the PCD sensitivity.

Table 9 — PCD load modulation reception limit

	PCD	
	$V_{LMA,\ PCD}$ [mV (peak)]	**Test PCD assembly**
Measured with Reference PICC 1	$20/H^{0,5}$	Test PCD assembly 1
Measured with Reference PICC 2	$\text{Min}(12,5 ; 20/H^{0,5})$	Test PCD assembly 1
Measured with Reference PICC 3	$\text{Min}(12,5 ; 20/H^{0,5})$	Test PCD assembly 1
Measured with Reference PICC 4 (optional)	$\text{Min}(16 ; 36/H^{0,5})$	Test PCD assembly 2
Measured with Reference PICC 5 (optional)	$\text{Min}(13 ; 31/H^{0,5})$	Test PCD assembly 2
Measured with Reference PICC 6 (optional)	$\text{Min}(6 ; 23/H^{0,5})$	Test PCD assembly 2

NOTE 1 The PICC load modulation amplitude limits of classes 2 to 6 are less strict than the previous PICC limit in ISO/IEC 14443-2:2010.

NOTE 2 For “Class 4”, “Class 5” and “Class 6” PICCs, the use of test PCD assembly 2 increases the measured values of load modulation by a factor of approximately 2 compared with test PCD assembly 1.

Figure 11 to 15 are illustrations of the PCD and PICC load modulation amplitude limits for each class.

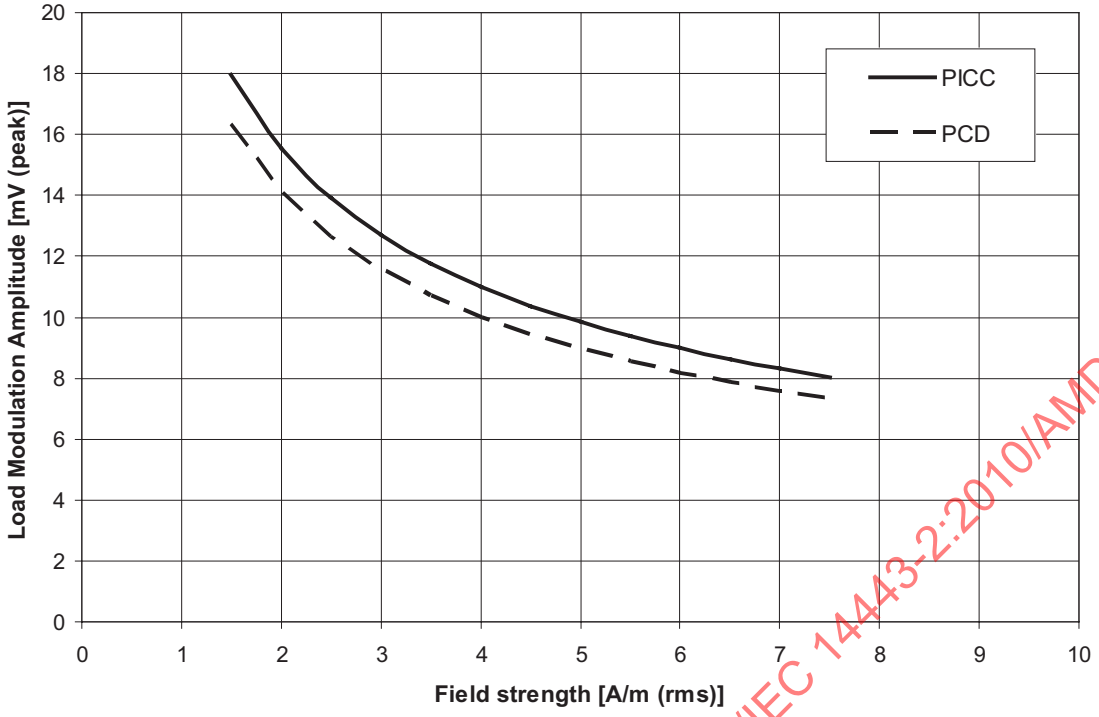

Figure 11 — Load modulation amplitude limits for “Class 1”

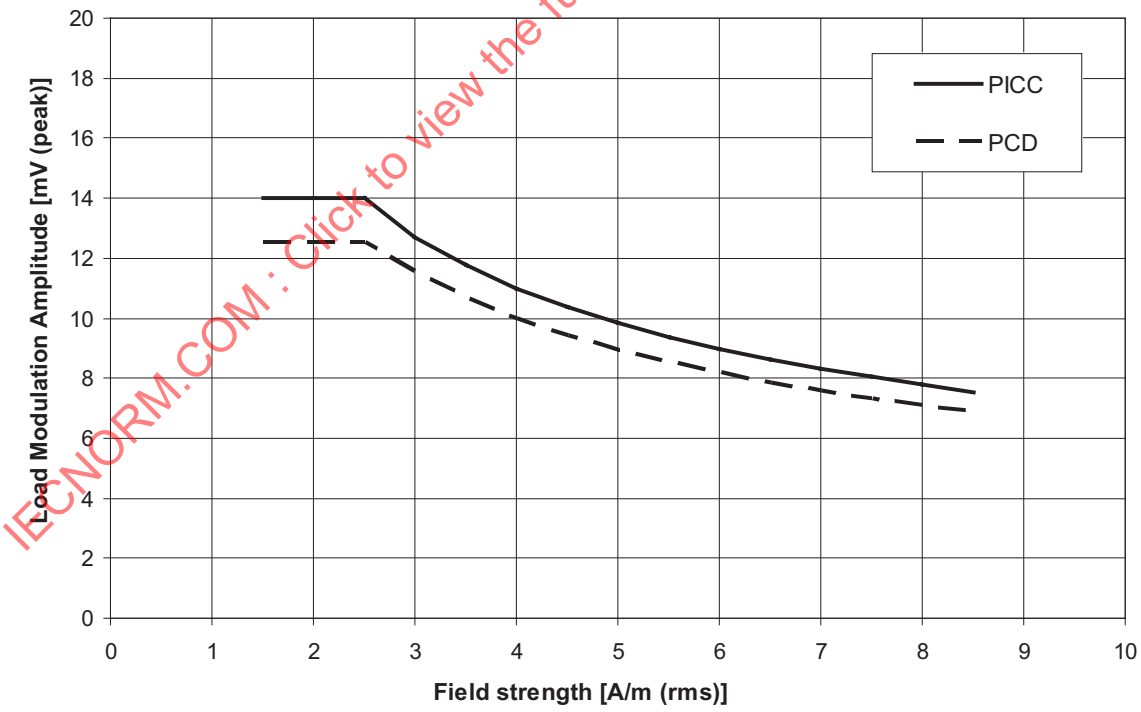

Figure 12 — Load modulation amplitude limits for “Class 2” and “Class 3”

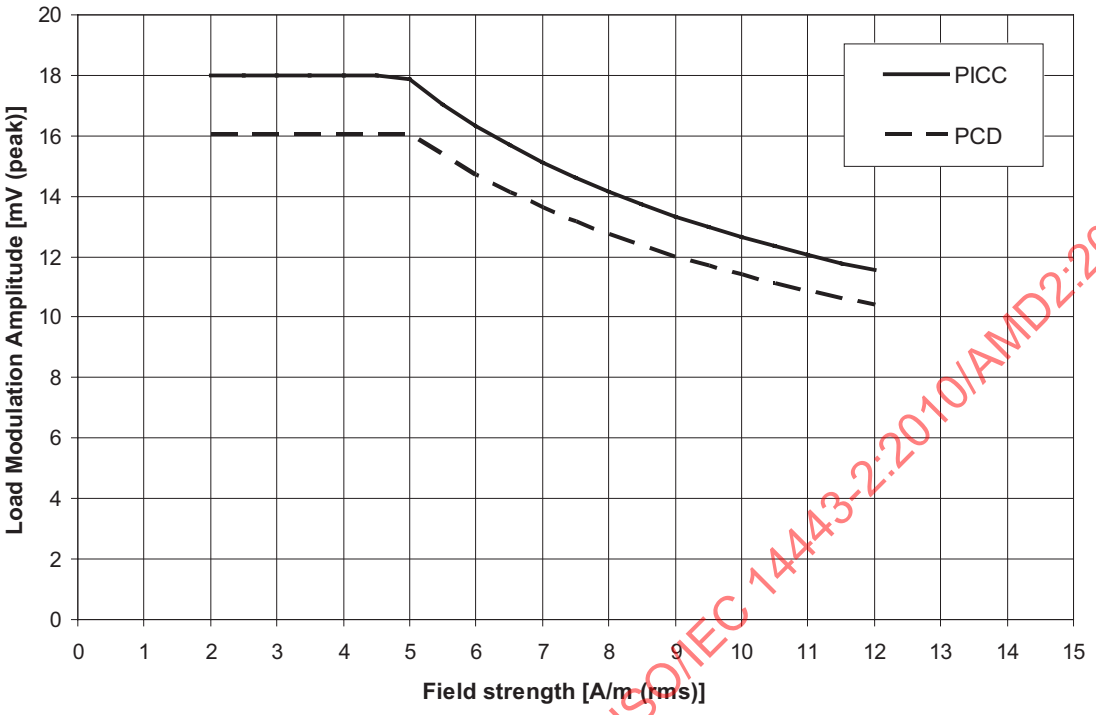

Figure 13 — Load modulation amplitude limits for “Class 4”

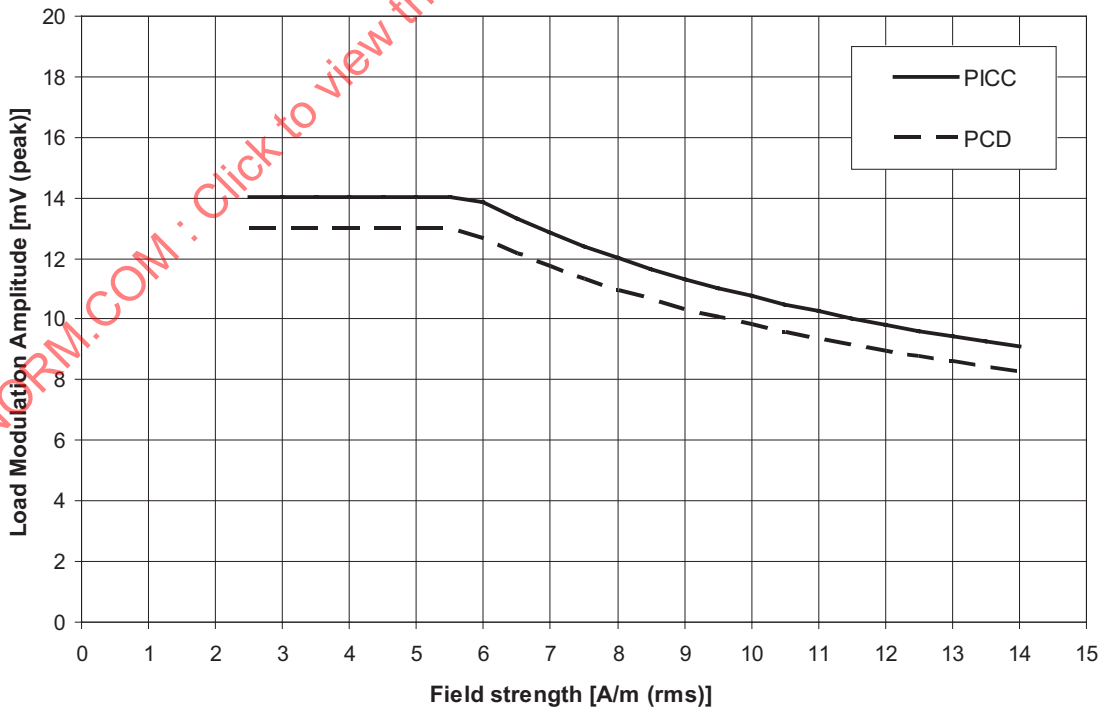

Figure 14 — Load modulation amplitude limits for “Class 5”