INTERNATIONAL STANDARD

ISO/IEC 10373-6

Second edition
2011-01-15

AMENDMENT 1
2012-05-01

Identification cards — Test methods —

Part 6:
Proximity cards

AMENDMENT 1: Additional PICC classes

Cartes d'identification — Méthodes d'essai —

Partie 6: Cartes de proximité

AMENDEMENT 1: Classes addtionnelles de PICC

Reference number
ISO/IEC 10373-6:2011/Amd.1:2012(E)

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Published in Switzerland

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 1 to ISO/IEC 10373-6:2011 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and personal identification*.

Identification cards — Test methods —

Part 6:
Proximity cards

AMENDMENT 1: Additional PICC classes

Page 2, 3.1

Add the following term and definition, and renumber all subsequent definitions:

3.1.5
loading effect
change in PCD antenna current caused by the presence of PICC(s) in the field due to the mutual coupling modifying the PCD antenna resonance and quality factor

Page 5, 3.2

Add the following symbol between UT_APDU and WUPB(N):

V_{load} DC voltage measured at connector CON3 of the Reference PICC

Page 6, 5.2

Replace 5.2 and its subclauses by the following:

5.2 Calibration coils

This clause defines the size, thickness and characteristics of the calibration coils 1 and 2.

Calibration coil 1 shall be used only in test PCD assembly 1 and calibration coil 2 shall be used only in test PCD assembly 2.

5.2.1 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 7810:2003 containing a single turn coil concentric with the card outline (see Figure 1).

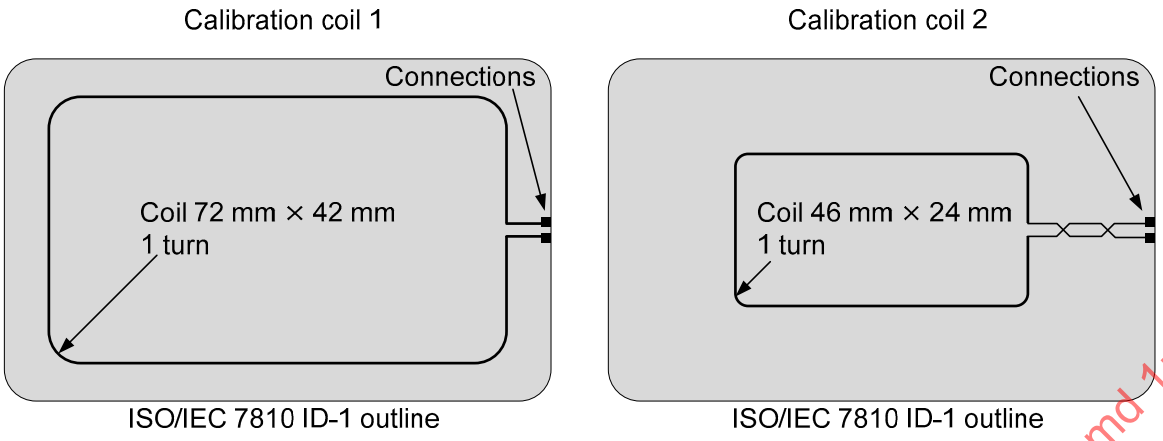


Figure 1 — Calibration coils 1 and 2

5.2.2 Thickness and material of the calibration coil card

The thickness of the calibration coil card shall be less than that of an ID-1 card. It shall be constructed of a suitable insulating material.

5.2.3 Coil characteristics

The coil on the calibration coil card shall have one turn. Relative dimensional tolerance shall be ± 2 %.

The outer size of the calibration coil 1 shall be 72 mm × 42 mm with corner radius 5 mm.

NOTE 1 The area over which the field is integrated is approximately 3000 mm^2.

NOTE 2 At 13,56 MHz the approximate inductance is 250 nH and the approximate resistance is 0,4 Ω.

The open circuit calibration factor for the calibration coil 1 is 0,318 V (rms) per A/m (rms) [Equivalent to 900 mV (peak-to-peak) per A/m (rms)].

The outer size of the calibration coil 2 shall be 47 mm × 24 mm with corner radius 2 mm.

NOTE 3 The area over which the field is integrated is approximately 1100 mm^2.

NOTE 4 At 13,56 MHz the approximate inductance is 140 nH and the approximate resistance is 0,3 Ω.

The open circuit calibration factor for the calibration coil 2 is 0,118 V (rms) per A/m (rms) [Equivalent to 333 mV (peak-to-peak) per A/m (rms)].

The coil shall be made as a printed coil on printed circuit board (PCB) plated with 35 µm copper. Track width shall be 500 µm with a relative tolerance of ± 20 %. The size of the connection pads shall be 1,5 mm × 1,5 mm.

A high impedance oscilloscope probe with an input admittance equivalent to a parallel capacitance C_p < 14 pF and a parallel resistance R_p > 9 kΩ at 13,56 MHz shall be used to measure the (open circuit) voltage induced in the coil.

NOTE 5 The high impedance oscilloscope probe ground connection should be as short as possible, less than 20 mm or coaxial connection.

Page 7, 5.3

Replace 5.3 and its subclauses by the following:

5.3 Test PCD assembly

Two test PCD assemblies are defined:

— Test PCD assembly 1 for PICCs of classes 1, 2 and 3 and for PICCs which do not claim compliance with a class;

— Test PCD assembly 2 for PICCs of classes 4, 5 and 6.

Each test PCD assembly shall consist of a circular test PCD antenna and two parallel sense coils: sense coil a and sense coil b. The test set-up is shown in Figure 2. The sense coils shall be connected such that the signal from one coil is in opposite phase to the other. The 10 Ω 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 1 The capacitance of the connections and of the oscilloscope probe should be kept to a minimum for reproducibility.

NOTE 2 In order to avoid any unintended misalignment in case of an unsymmetrical set-up the tuning range of the potentiometer P1 is only 10 Ω. If the set-up cannot be compensated by the 10 Ω potentiometer P1 the overall symmetry of the set-up should be checked.

NOTE 3 The high impedance oscilloscope probe ground connection should be as short as possible, less than 20 mm or coaxial connection.

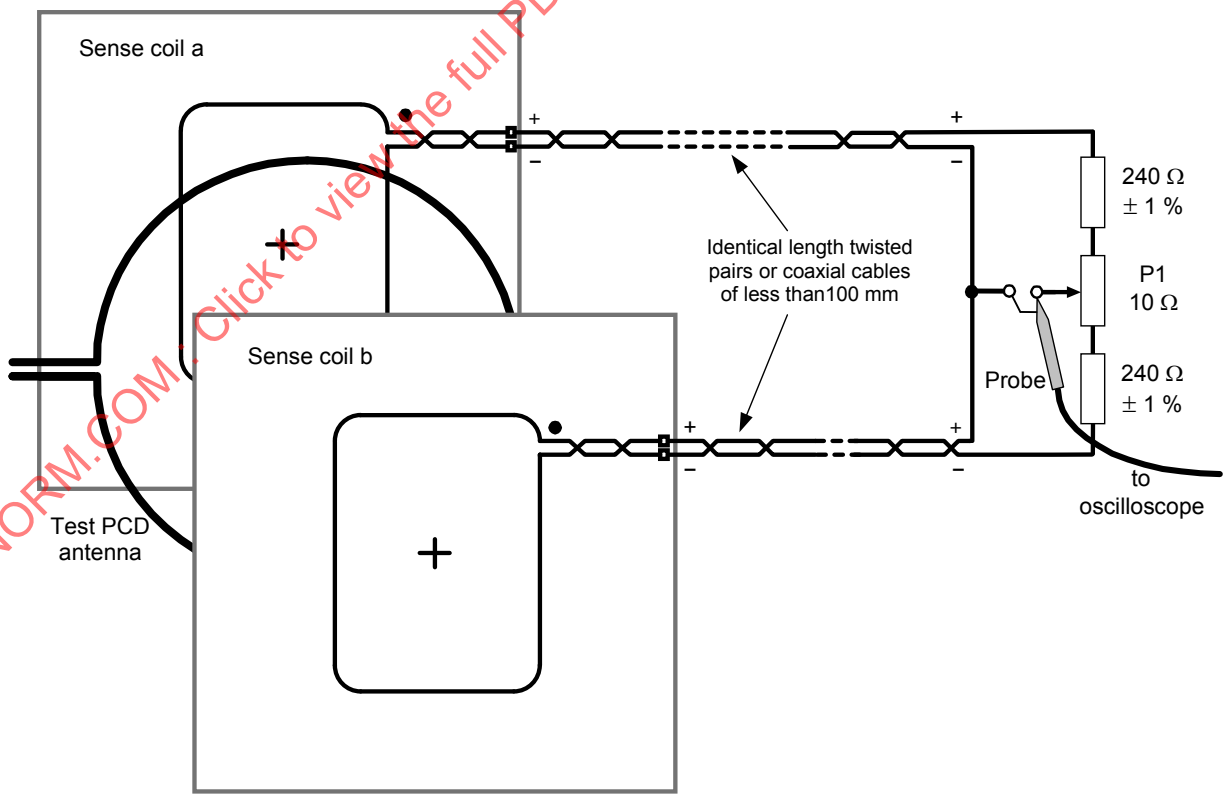


Figure 2 — Test set-up (principle)

5.3.1 Test PCD antenna

In test PCD assembly 1 the test PCD antenna 1 shall have a diameter of 150 mm.

In test PCD assembly 2 the test PCD antenna 2 shall have a diameter of 100 mm.

Each test PCD antenna construction shall conform to the corresponding drawings in Annex A.

The matching of each test PCD antenna should be accomplished by using an impedance analyzer or a network analyzer or an LCR meter. If either an impedance analyzer or a network analyzer or an LCR meter is not available, then the matching may be accomplished with the procedure given in Annex B.

5.3.2 Sense coils

In test PCD assembly 1 the size of the sense coils 1 shall be 100 mm × 70 mm with corner radius 10 mm.

In test PCD assembly 2 the size of the sense coils 2 shall be 60 mm × 47 mm with corner radius 10 mm.

Each sense coil construction shall conform to the corresponding drawings in Annex C.

5.3.3 Assembly of Test PCD

The sense coils 1 and test PCD antenna 1 shall be assembled parallel and with the sense and antenna coils coaxial and such that the distance between the active conductors is 37,5 mm as shown in Figure 3.

The sense coils 2 and test PCD antenna 2 shall be assembled parallel and with the sense and antenna coils coaxial and such that the distance between the active conductors is 23 mm as shown in Figure 3.

The dimensional tolerance shall be better than ± 0,5 mm. The distance between the coil in the DUT and the calibration coil shall be equal with respect to the coil of the test PCD antenna.

NOTE These distances are chosen to offer a strong and homogenous magnetic field in the DUT position.

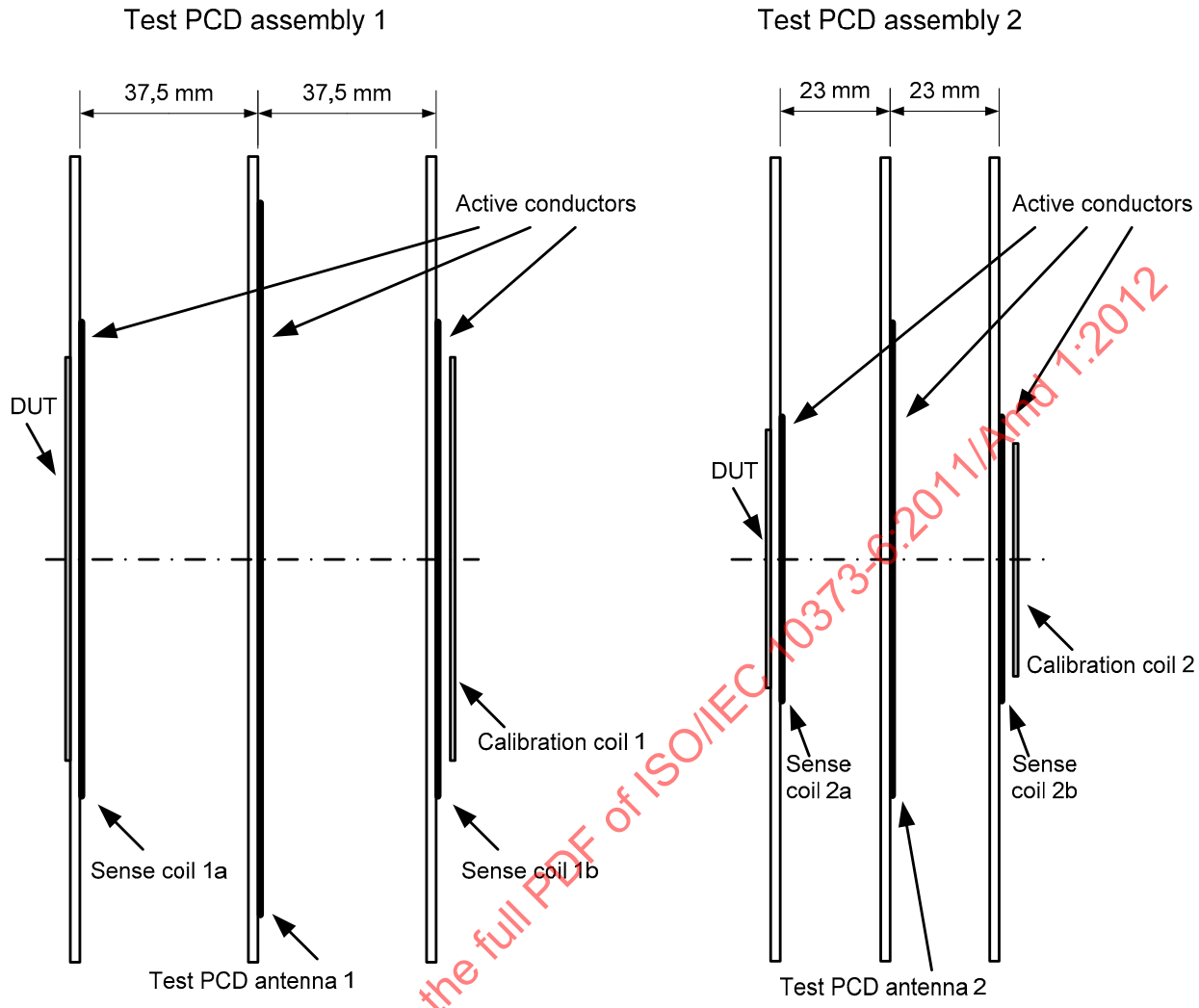


Figure 3 – Test PCD assembly 1 and test PCD assembly 2

Page 10, 5.4.2

Replace the first paragraph with the following:

"The Reference PICCs coils layouts are defined in Annex D. If connectors are used between the coils and the circuitry, those connectors shall have minimal, if any, effect on the RF measurements."

Page 11, 5.4.3

Replace "6 V" by "V_{load}" in steps f), g) and i) and in NOTE.

Page 12, 6.2.1.2

Replace step a) with the following:

a) Adjust the RF power delivered by the signal generator to the test PCD antenna to a field strength of the average level specified in ISO/IEC 14443-1:2008, 4.4 as measured by the calibration coil.

Page 13 of ISO/IEC 10373-6:2011, 6.2.1.2

Replace step d) with the following:

d) Adjust the RF power delivered by the signal generator to the test PCD antenna to a field strength of the maximum level specified in ISO/IEC 14443-1:2008, 4.4 as measured by the calibration coil.

Page 13, 6.2.1.2

Replace step f) with the following:

f) Apply for 5 min an ASK 100 % modulation to this field with the following duty cycle:

— 5 s at 0 A/m (rms);

— 25 s at the maximum level specified in ISO/IEC 14443-1:2008, 4.4.

Page 14, 7.1

Replace the first sentence with the following paragraphs, table and note:

"All the PCD tests described below will be done in the operating volumes as defined by the PCD manufacturer for each supported class.

All PCD tests of ISO/IEC 14443-2 parameters shall be performed using Reference PICCs 1, 2 and 3 and optionally other Reference PICCs corresponding to the optional classes supported by the PCD, with the relevant parameters and test PCD assembly as defined in Table 3.

Table 3 — Classes parameters

Class	Reference PICC	V_{load}	$R2_{min}$	$R2_{max}$	Test PCD assembly
1	1	6 V	870 Ω	1070 Ω	Test PCD assembly 1
2	2	4,5 V	1030 Ω	1260 Ω	Test PCD assembly 1
3	3	4,5 V	1080 Ω	1320 Ω	Test PCD assembly 1
4	4	4,5 V	990 Ω	1210 Ω	Test PCD assembly 2
5	5	4,5 V	960 Ω	1170 Ω	Test PCD assembly 2
6	6	4,5 V	900 Ω	1100 Ω	Test PCD assembly 2

NOTE V_{load} may be harmonized to 4,5 V for all classes in future revisions of ISO/IEC 10373-6."

Page 15, 7.1.1

Add the following paragraph at the end of the subclause:

"The maximum and minimum field strength values to be used with each Reference PICC are given in ISO/IEC 14443-2:2010/Amd.2:—[1], Table 1."

Page 15, 7.1.1.2

Replace items a) to d) in the Procedure for H_{min} test with the following:

a) Tune the Reference PICC to 13,56 MHz as described in 5.4.3.

b) Place the Reference PICC into the DUT position on the Test PCD assembly producing the H_{min} operating condition on the calibration coil. Check that the jumper J1 is set to position 'b' and that a DC voltage of V_{load} as defined in Table 3 is measured at connector CON3. Alternatively, the jumper J1 may be set to position 'c' and the voltage on CON2 is adjusted to obtain a DC voltage of V_{load} as defined in Table 3 at connector CON3. In both cases, the operating field condition shall be verified by monitoring the voltage on the calibration coil and adjusted if necessary.

WARNING — R2 value should be between $R2_{min}$ and $R2_{max}$ as defined in Table 3. Check this range at least once before using the alternative method.

c) Position the Reference PICC within the defined operating volume of the PCD under test. The DC voltage at CON3 shall exceed V_{load} as defined in Table 3.

Page 15, 7.1.1.3

Replace the paragraph with the following:

"The test report shall confirm the operating volume in which the DC voltage measured at CON3 for R2 or variable load resistor adjusted to H_{min} and H_{max} field strength fulfils the requirements defined in steps d) of the two procedures of 7.1.1.2."

Page 15, 7.1.2

Delete 7.1.2 and its subclauses.

Page 16, 7.1.3

Delete 7.1.3 and its subclauses.

[1] To be published.

Page 16, 7.1.4.2

Replace step d) by the following:

d) Apply and adjust a DC voltage at CON2 to obtain a DC voltage at connector CON3 of V_{load} as defined in Table 3.

Page 17, 7.1.5.2

Replace step c) by the following:

c) Apply and adjust a DC voltage at CON2 to obtain a DC voltage at connector CON3 of V_{load} as defined in Table 3.

Page 18, 7.2.1.2

Replace the first paragraph starting with "Step 1" with the following:

"Step 1: The load modulation test circuit of Figure 2 and the test PCD assembly of Figure 3 defined for the PICC class (see ISO/IEC 14443-2:2010/Amd.2:—, 8.2.2) are used. 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 select the test PCD assembly 1."

Page 21, 7.2.4

Replace 7.2.4 and its subclauses with the following:

7.2.4 PICC maximum loading effect

7.2.4.1 Purpose

This test is used to measure the PICC loading effect.

7.2.4.2 Test procedure

Depending on the claimed PICC class, select:

— the relevant H_{min} as defined in ISO/IEC 14443-2:2010/Amd.2:—, Table 2;

— the relevant Reference PICC as defined in Table 3 and its reference voltage V_{load};

— the relevant test PCD assembly as defined in Table 3.

If the PICC does not claim any particular class as specified in ISO/IEC 14443-1:2008/Amd.1:2012, then "Class 1" parameters, test apparatus and circuits shall be used for this test.

The PICC loading effect at H_{min} shall be measured using the Test PCD assembly. It shall not exceed the loading effect of the selected Reference PICC tuned to 13,56 MHz and calibrated to obtain V_{load} at CON3 at H_{min}. The procedure of this substitution method is as follows.

a) Tune the selected Reference PICC to 13,56 MHz as described in 5.4.3.

b) Calibrate the Test PCD assembly to produce the H_{min} operating condition on the calibration coil.

c) Place the Reference PICC into the DUT position on the Test PCD assembly. Switch the jumper J1 to position 'b' and adjust R2 to obtain a DC voltage of V_{load} measured at connector CON3. Alternatively, jumper J1 may be set to position 'c' and the applied voltage on CON2 is adjusted to obtain a DC voltage of V_{load} at connector CON3. In both cases, the operating field condition shall be verified by monitoring the voltage on the calibration coil and adjusted if necessary.

WARNING — R2 value should be between $R2_{min}$ and $R2_{max}$ as defined in Table 3. Check this range at least once before using the alternative method.

d) Remove the Reference PICC.

e) Place the PICC under test into the DUT position on the Test PCD assembly.

f) Measure the field strength monitored by the calibration coil.

This field strength shall be greater than H_{min}.

7.2.4.3 Test report

The test report shall give the value of the measured field strength.

Page 23, Annex A

Replace all occurrences of “test PCD antenna” with “test PCD antenna 1”.

Add a new subclause at the end of Annex A:

A.3 Test PCD antenna 2

A.3.1 Test PCD antenna 2 layout including impedance matching network

Figures A.7 and A.8 illustrate the Test PCD antenna 2 layout. Drawings are not to scale.

The antenna coil track width is 1,8 mm (except for through-plated holes).

Starting from the impedance matching network there are crossovers every 45°.

Printed circuit board (PCB): FR4 material, thickness 1,6 mm, double sided with 35 µm copper.

NOTE 1 The layout and the position of the impedance matching network are informative. The outer PCB dimensions are informative.

NOTE 2 Such printed circuit boards and R_{ext} resistors are available from various commercial sources.

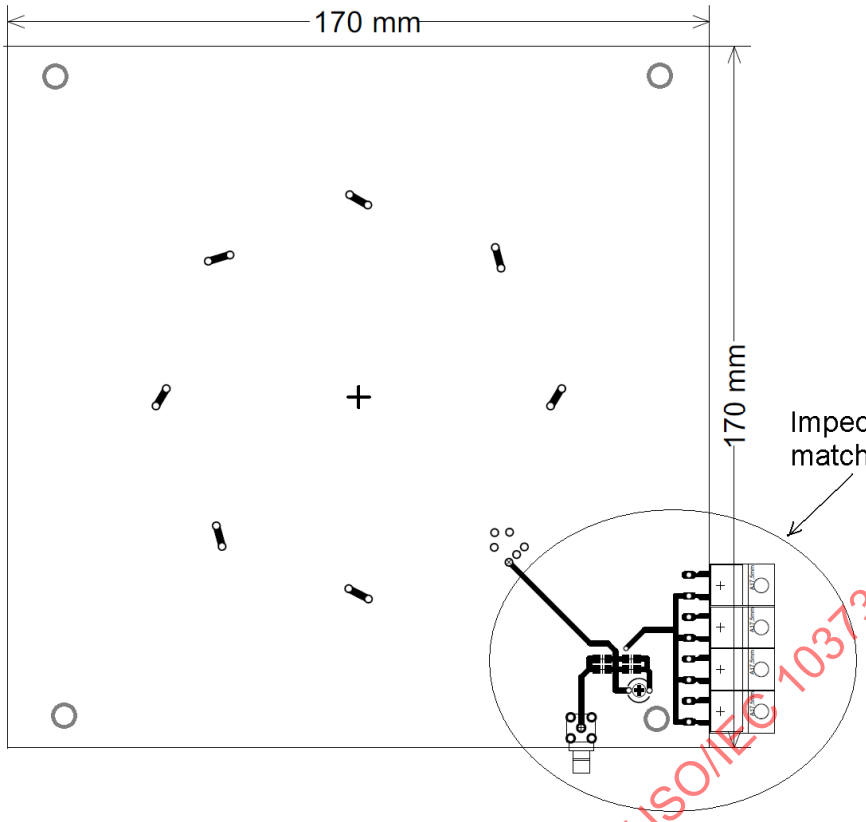


Figure A.7 — Test PCD antenna 2 layout including impedance matching network (view from front)

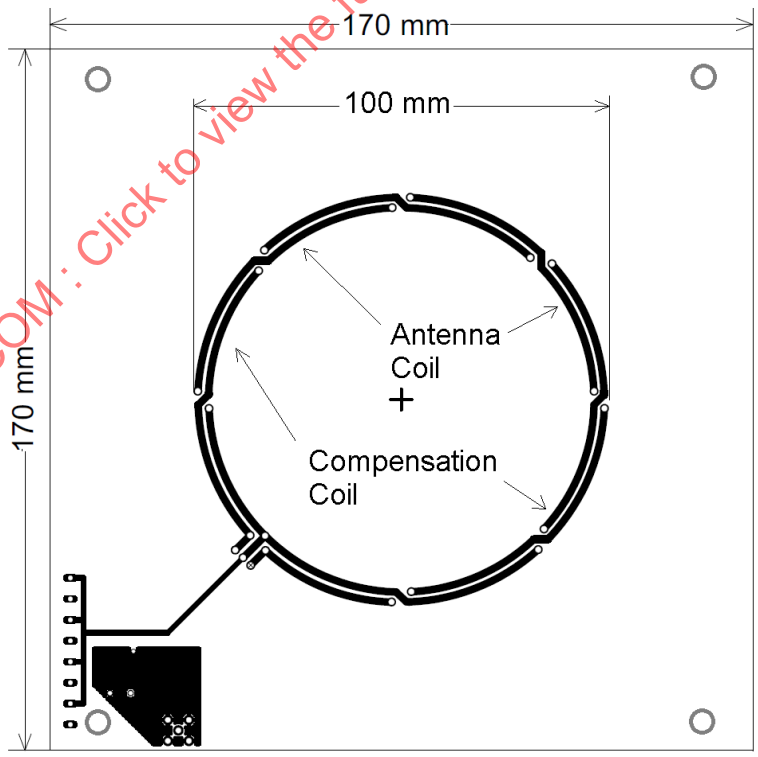
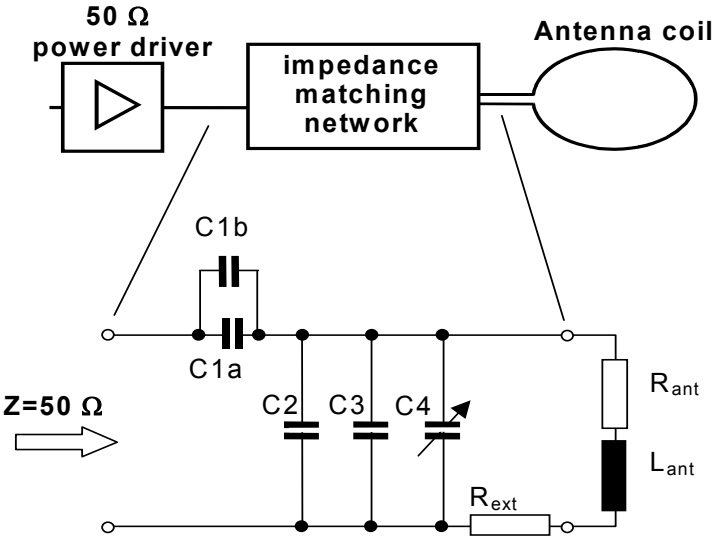


Figure A.8 — Test PCD antenna 2 layout including impedance matching network (view from back)

A.3.2 Impedance matching network 2



Component Table:

	Value	Unit	Remarks
C1a	100	pF	Voltage range 200 V
C1b	12	pF	Voltage range 200 V
C2	270	pF	Voltage range 200 V
C3	18	pF	Voltage range 200 V
C4	2-27	pF	Voltage range 200 V
R_{ext}	2,7	Ω	Power range 20 W

Figure A.9 — Impedance matching network 2

NOTE 1 R_{ext} may be built by either a parallel circuit composed of two equal branches having two resistors of 2,7 Ω 5 W in series each or a parallel circuit of 10 Ω, 10 Ω, 10 Ω and 15 Ω, 5 W.

NOTE 2 R_{ext} should be placed on the GND side of the antenna as drawn.

NOTE 3 The parasitic capacitance of the antenna is not shown in Figure A.9.

Page 31, C.1

Add the following subclause title directly under the C.1 title:

C.1.1 Sense coil 1 layout

Replace the first sentence with “Figure C.1 illustrates the sense coils 1 layout.”.

Page 31, Figure C.1

Replace the figure title with the following:

“**Figure C.1 — Layout for sense coils 1 (a and b)**”

Page 32, Annex C

Add the following subclause before C.2 and renumber subsequent figures in Annex C:

C.1.2 Sense coil 2 layout

Figure C.2 illustrates the sense coils 2 layout. Drawings are not to scale.

The sense coil track width is 0,5 mm with relative tolerance ± 20 % (except for through-plated holes). Size of the coils refers to the outer dimensions.

Printed circuit board (PCB): FR4 material, thickness 1,6 mm, double sided with 35 µm copper.

NOTE Such printed circuit boards are available from various commercial sources.

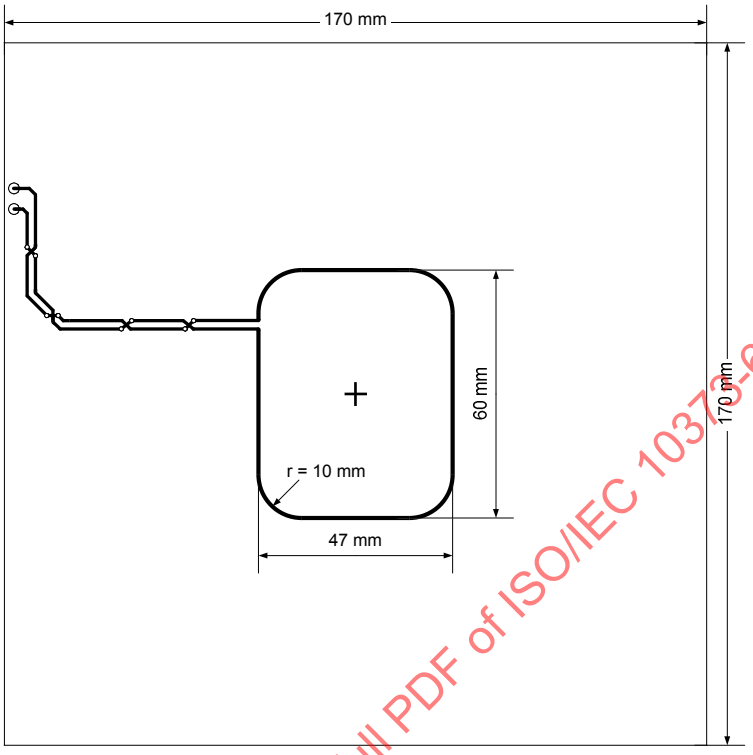


Figure C.2 — Layout for sense coils 2 (a and b)

Page 33, Annex D

Replace the annex title with the following:

“Reference PICCs”

Page 33, Annex D

Add the following subclause title above the first sentence:

D.1 Reference PICC 1 coil layouts

Replace the first sentence with the following:

“Figure D.1 specifies the Reference PICC 1 Pick up coil and Main coil layouts.”

Page 33, Figure D.1

Replace the figure title with the following:

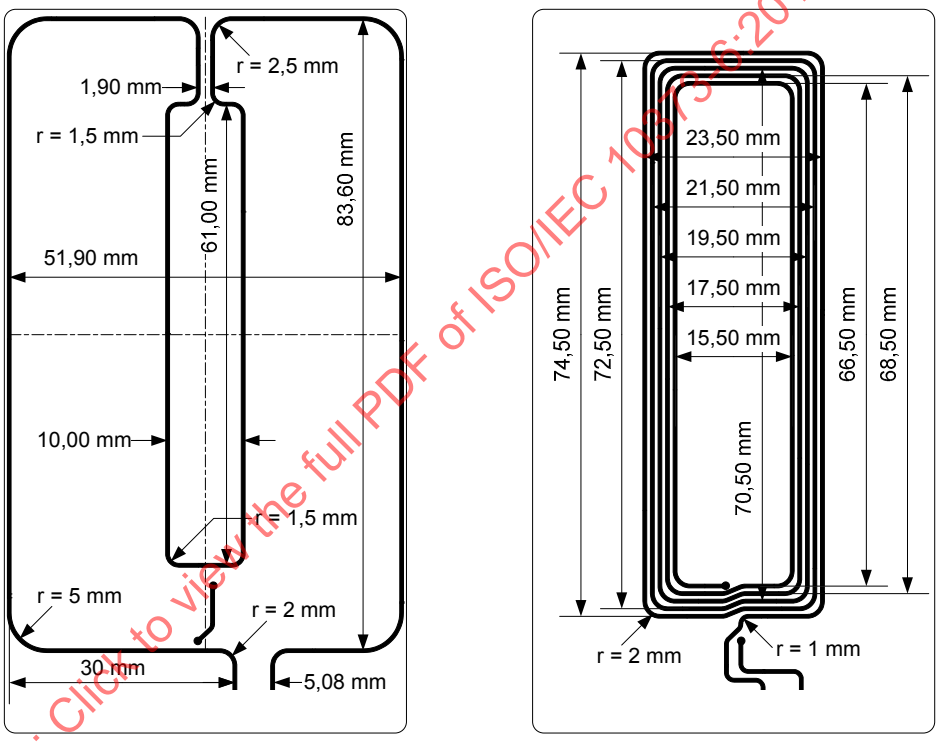
"**Figure D.1 — Reference PICC 1 Pick up coil and Main coil layouts**"

Page 33, Annex D

Add following subclauses at the end of the annex:

D.2 Reference PICC 2 coil layouts

Figure D.2 specifies the Reference PICC 2 Pick up coil and Main coil layouts.



(View from front, Pick up coil) (View from back, Main coil)

Figure D.2 — Reference PICC 2 Pick up coil and Main coil layouts

Dimensions to track center (drawings are not to scale).

Main coil dimensions: 75 mm × 24 mm (outer dimensions).

The Pick up coil and the Main coil shall be concentric.

The two coils track width and spacing shall be 0,5 mm with a relative tolerance of ± 20 %.

All main coil corners radii shall be 2 mm.

Printed circuit board (PCB): FR4 material, thickness 0,76 mm with a relative tolerance of ± 10 %, double sided with 35 µm copper.