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Cards and personal identification

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Additional material for Clause 2 Normative references

ISO/IEC 7816-2, *Identification cards - Integrated circuit(s) cards with contacts - Part 2: Dimensions and location of the contacts*.

IEC 61000-4-2, Electrostatic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.

Additional material for Clause 3 Terms and definitions

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

3.15
ICC
integrated circuit(s) card

3.16
typical protocol and application specific communication
any communication between a DUT and the corresponding test-apparatus based on protocol and application implemented in the DUT and representing its normal use

3.17
Test Scenario
a defined typical protocol and application specific communication to be used with the test methods defined in this document

3.18
PICC
Proximity integrated circuit(s) card

Additional material for Clause 4 General items applicable to the test methods

4.6 Conventions for electrical measurements on ICCs with contacts

Potential differences are defined with respect to the GND contact of the ICC and currents flowing to the ICC are considered positive.

4.7 Apparatus for measurements on ICCs with contacts

4.7.1 Default ICC-holder, reference axes and default measurement position

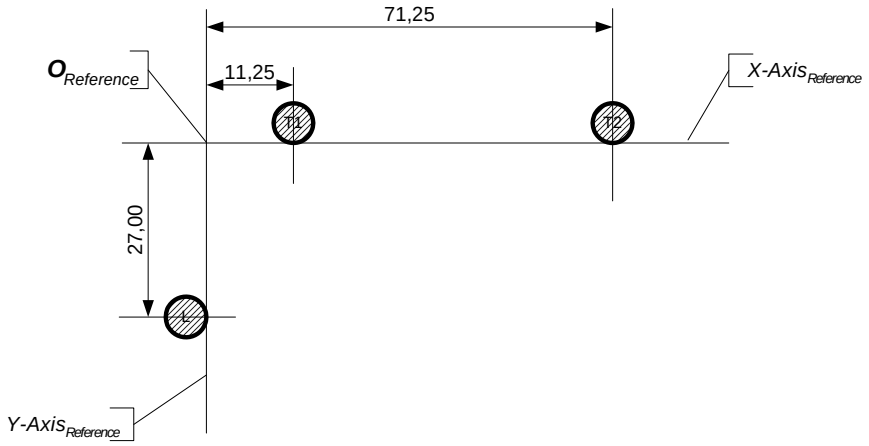
When required by the test-method, the ICC shall be positioned in the default measurement position as subsequently defined.

The default measurement position requires the ICC to be positioned in an ICC-holder and flattened by a flattening plate. All Measurements using this default measurement position shall be relative to the reference axes defined in Figure 1.

4.7.2 Default ICC-holder and reference axes:

The default ICC holder shall comply with Figure 1:

Dimensions in millimetres
All Tolerances ± 0,01 mm

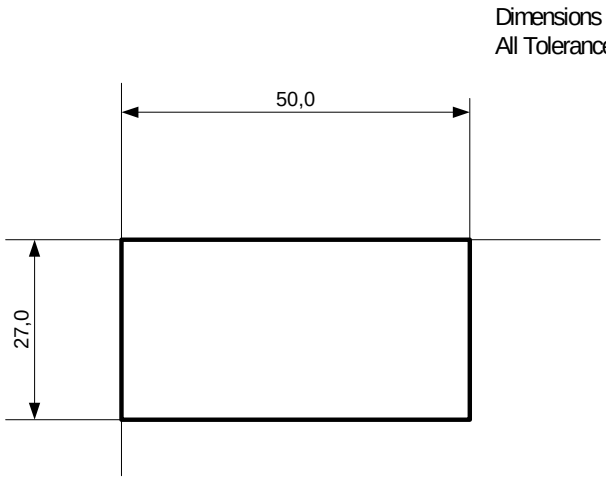


L, T1 and T2 shall be metal cylinders, having a diameter of 5 mm ± 0,1 mm, a surface roughness R_a < 5 µm, mounted on a level rigid plate with a surface roughness R_a < 5 µm.

Figure 1 — ICC-holder

4.7.3 Flattening Plate

The flattening plate shall comply with Figure 2:

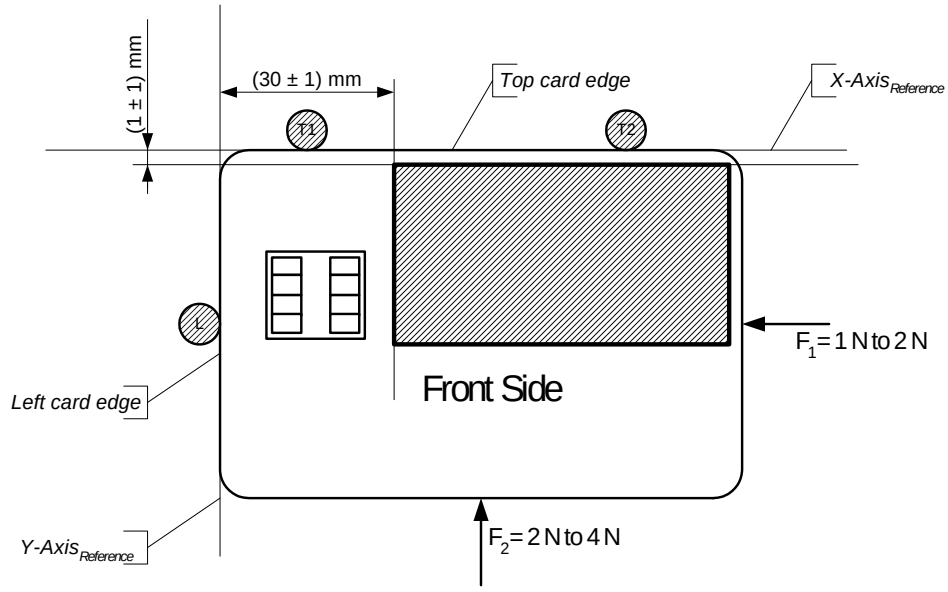


The surface roughness of the flattening plate shall be $R_a < 5$ µm.

Figure 2 — Flattening plate

4.7.4 Default Measurement Position

The ICC and the flattening plate shall be mounted on the ICC-holder as shown in Figure 3:



F_1 and F_2 are forces applied to the center of the right and the bottom edge of the card respectively to fix the card in the card-holder.
The flattening plate shall apply a force of 2,2 N ± 0,2 N to the surface of the card

Figure 3 — Position of ICC and flattening plate on ICC-holder

Changed material for Clause 5

In 5.4.1.1 g), correct the formula for ethylene glycol to $HOCH_2CH_2OH$

Additional material for Clause 5 Test methods

5.17 Dimension and Location of Contacts for ICCs with contacts

The purpose is to determine the compliance of the dimensions and the location of the ICC's contacts with ISO/IEC 7816-2.

5.17.1 Apparatus

An ICC-Holder and a flattening plate compliant with clause 0

Any device capable of executing the procedure below with the defined accuracy.

5.17.2 Procedure

a) Mount the ICC in the default measurement position as defined in 4.6.1.

b) Construct two lines parallel to the $X\text{-}Axis_{Reference}$ and two lines parallel to the $Y\text{-}Axis_{Reference}$ on the ICC surface, forming the minimum contact area C1 as defined in ISO/IEC 7816-2 with an accuracy of equal to or better than 0,01 mm.

c) Check if the rectangular area enclosed by the four lines is completely covered by contact metallization and note the result.

d) Check if the metallization within the rectangular area enclosed by the four lines is connected to metallization in any other minimum contact area and note the result.

e) Repeat b) to d) for the minimum contact areas C2 to C8.

5.17.3 Test report

The test report shall state for each observed minimum contact area, whether it is completely covered by contact metallization and if it is connected to metallization in any other minimum contact area.

5.18 Static electricity test for ICCs with contacts

IEC 61000-4-2 shall be used to test conformance with the static electricity requirements of the base standard.

5.18.1 Test Report

The test report shall state whether or not the card under test remained testably functional following the exposure.

5.19 Static electricity test for proximity ICCs

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 PICC under test is exposed to a simulated electrostatic discharge (ESD, human body model) and its basic operation checked following the exposure..

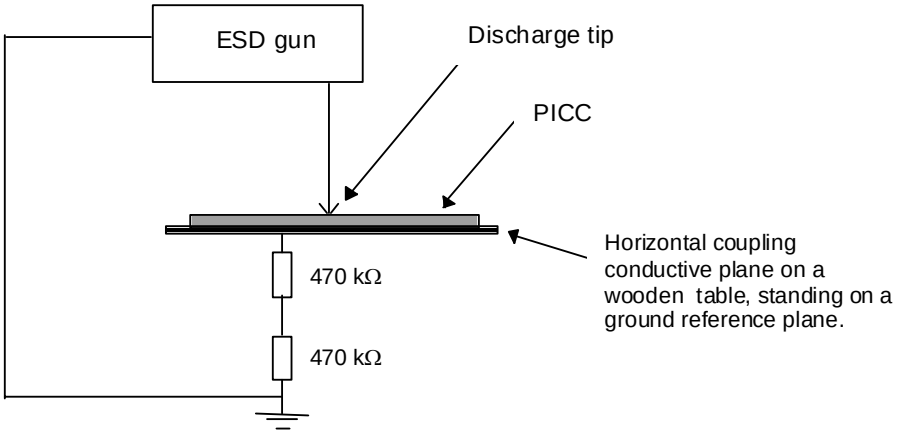


Figure 4 - ESD test circuit

5.19.1 Apparatus

Refer to IEC 61000-4-2:1995.

a) Main specifications of the ESD generator:

— energy storage capacitance: 150 pF ± 10 %;

— discharge resistance: 330 Ω ± 10 %;

— charging resistance: between 50 MΩ and 100 MΩ;

— rise time: 0,7 ns to 1 ns.

b) Selected specifications from the optional items:

— type of equipment: table top equipment;

— discharge method: direct application of air discharge to the equipment under test;

— discharge electrodes of the ESD generator: Round tip probe of 8 mm diameter.

5.19.2 Test procedure

Connect the ground pin of the apparatus to the conductive plate upon which the PICC is placed (see Figure 4).

Apply the discharge successively in normal polarity to each of the 20 test zones shown in Figure 5 ensuring that the discharge tip is not applied within 6 mm of the card perimeter (see the dashed boundary line in Figure 5) and allowing a cool-down period between successive pulses of at least 10 s.

Repeat the procedure with reversed polarity..

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

Check that the PICC operates as intended at the end of the test.

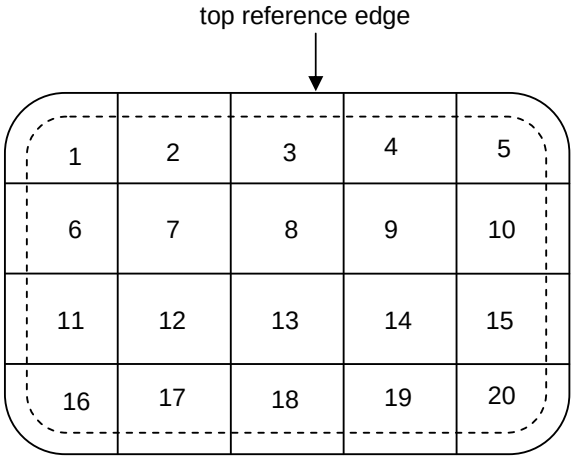


Figure 5 - Test zones on PICC for ESD test

5.19.3 Test report

The test report shall state whether or not the PICC operates as intended.

5.20 Electrical surface resistance of contacts of ICCs with contacts

The purpose of this test is to determine the surface resistance of the ICC contact surface.

Note This test method supersedes the test method defined in ISO/IEC 7816-1:1998, 4.2.5.

5.20.1 Apparatus

Ohmmeter with a range from 10 mΩ to 2 Ω having an accuracy of ± 2 mΩ and test prods as defined in Figure 6. The measurement current shall be less than or equal to 100 mA and the measurement voltage shall be less than or equal to 20 mV.

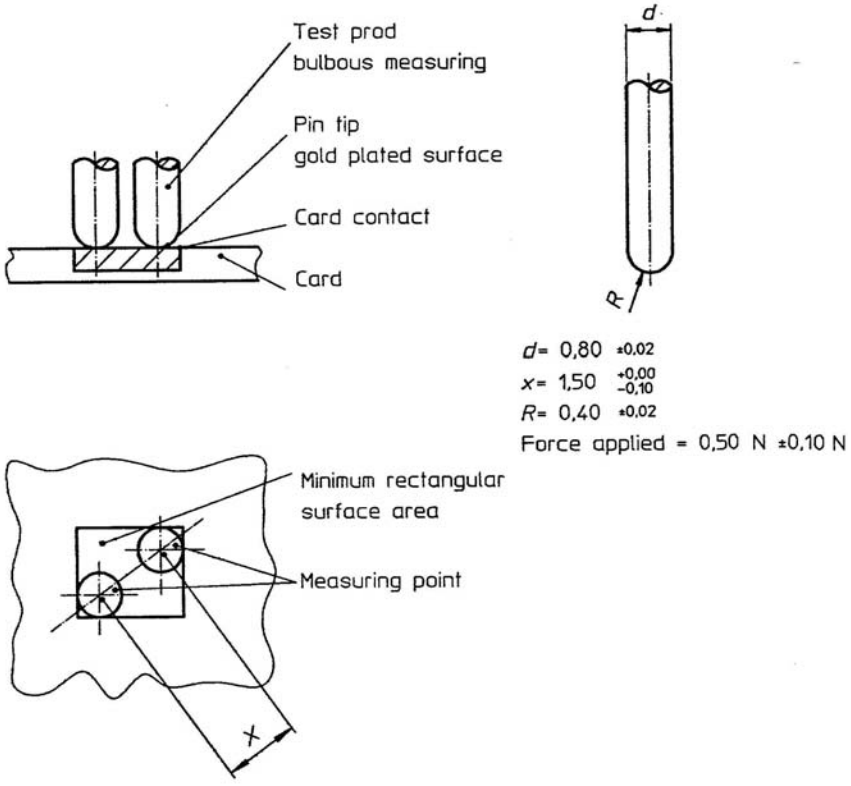


Figure 6 — Test prods

5.20.2 Procedure

Place the ICC on a flat hard surface.

Apply the two test prods to each present minimum contact area as defined in ISO/IEC 7816-2.

Measure the electrical resistance between the two test-prods for each present minimum contact area.

NOTE Start applying measurement current and voltage after making the mechanical contact.

5.20.3 Test report

Report the resistance values for each measured minimum contact area.

5.20.4 Preliminary requirement

The base standard does not specify a value corresponding to this test. Until the base standard is revised, 500 mΩ shall be used as the maximum allowed surface resistance.

5.10 Surface profile of contacts of ICCs with contacts

The purpose is to determine the difference in thickness between the ICC's contacts and the adjacent ICC surface.

5.21.1 Apparatus

An ICC-Holder and a flattening plate conforming to 4.7.2 and 4.7.3, respectively.

A measurement device capable of measuring the perpendicular distance between the upper surface of the level rigid plate of the ICC-holder and the upper surface of an ICC placed on the ICC-holder with an accuracy of 0,01 mm. The area of measurement shall be 2,5 mm wider in all directions than the area covered by the contact metallization of the ICC to be tested. The measurement tip shall be as shown in Figure 7:

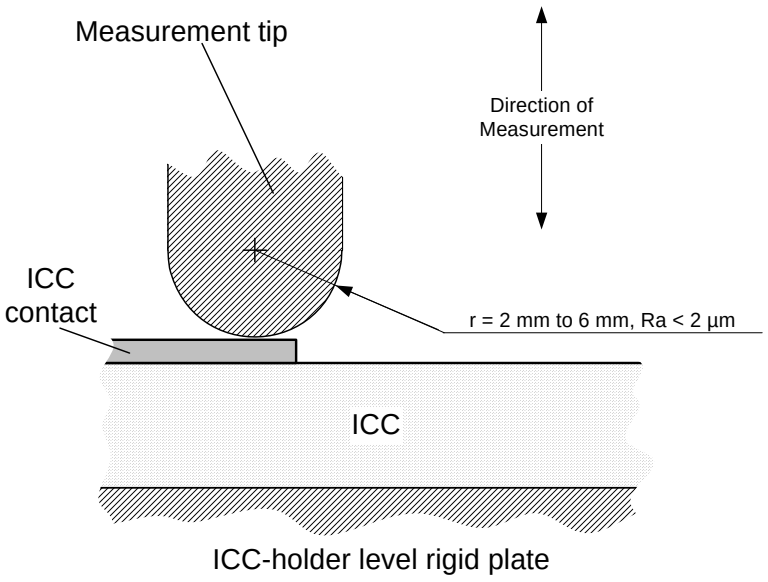


Figure 7 — Measurement tip

5.21.2 Procedure

The positioning tolerance of the measurement tip relative to the measurement line in the procedure below shall not exceed 0,5 mm.

a) Mount the ICC in the default measurement position as defined in 4.6.1.

b) Construct a measurement line on the surface of the ICC along the centerline of the minimum contact areas C1 and C5, beginning and ending at a distance of 2 mm of the metallized contact surface (Figure 8).

c) Measure the distance between the level rigid plate and the start and endpoint of the measurement line and calculate the arithmetic average of the two distances, subsequently called *'base thickness'*.

d) Determine the minimum and maximum distance between the level rigid plate and all points on the surface of the ICC along the measurement line.

e) Calculate the difference between the base thickness and the maximum and minimum distance determined under d) in such a way that a distance higher than the base thickness results in a positive value and a distance below in a negative.

f) Repeat b) to e) for the centerlines of the contacts C2 and C6, C3 and C7 and, if present, C4 and C8.

g) Determine the minimum and maximum value of all values determined under e).

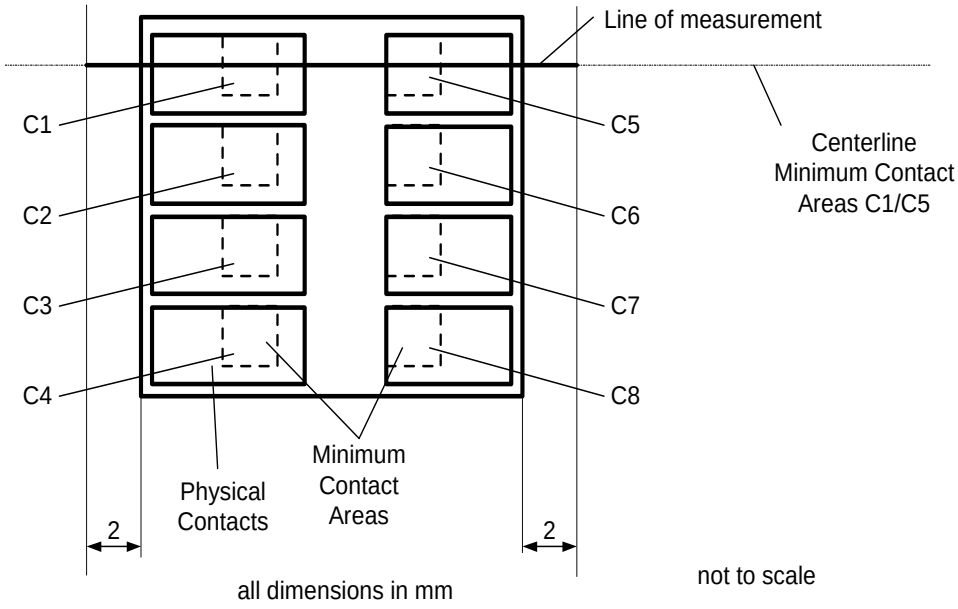


Figure 8 — Measurement line across contacts C1 and C5

5.21.3 Test report

Report the minimum and maximum value determined in the procedure, step g) and the radius of the measurement tip used.

5.21 ICC — Mechanical strength: 3 wheel test for ICCs with contacts

The purpose of this test is to determine the mechanical reliability of an ICC by moving the ICC cyclically between three steel wheels rolling over the contact area.

NOTE This test may not be relevant for ICCs with a die area of less than 4 mm^2.

5.22.1 Apparatus

The principle of the apparatus is shown in Figure 9. It comprises three wheels, one above and two below the ICC. The ICC is moved cyclically between the three wheels, so that the contact area is repeatedly exposed to the forces exerted by the wheels.

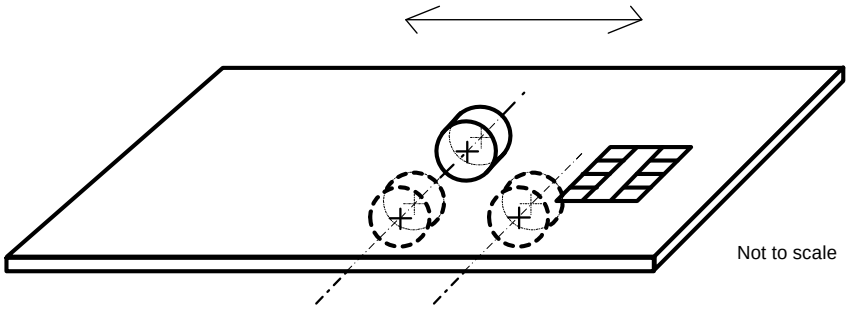


Figure 9 - 3 wheel test principle

The apparatus shall comprise three wheels mounted as shown in Figure 10. Wheels W2 and W3 are fixed. Wheel W1 can move in the direction perpendicular to the surface of the ICC with a maximum error of ± 5 ° and applies a force F as shown in Figure 10 to the surface of the ICC. The force F shall be applied by means of a static weight (in contrast to the dynamic stress that would be applied by a spring, stepper motor of pneumatic cylinder) fixed above wheel W1 such that the force direction shall pass through the axis of wheel W1. The resulting downward movement of wheel W1 shall be limited, so that the distance between axis B in Figure 10 and the surface of wheel W1 never becomes smaller than 3 mm.

The magnitude of the force F shall be that value defined by the base standard or, if the base standard does not define a value, 8,0N ± 0,5N.

Dimensions in mm
Default Tolerance ± 0,1 mm

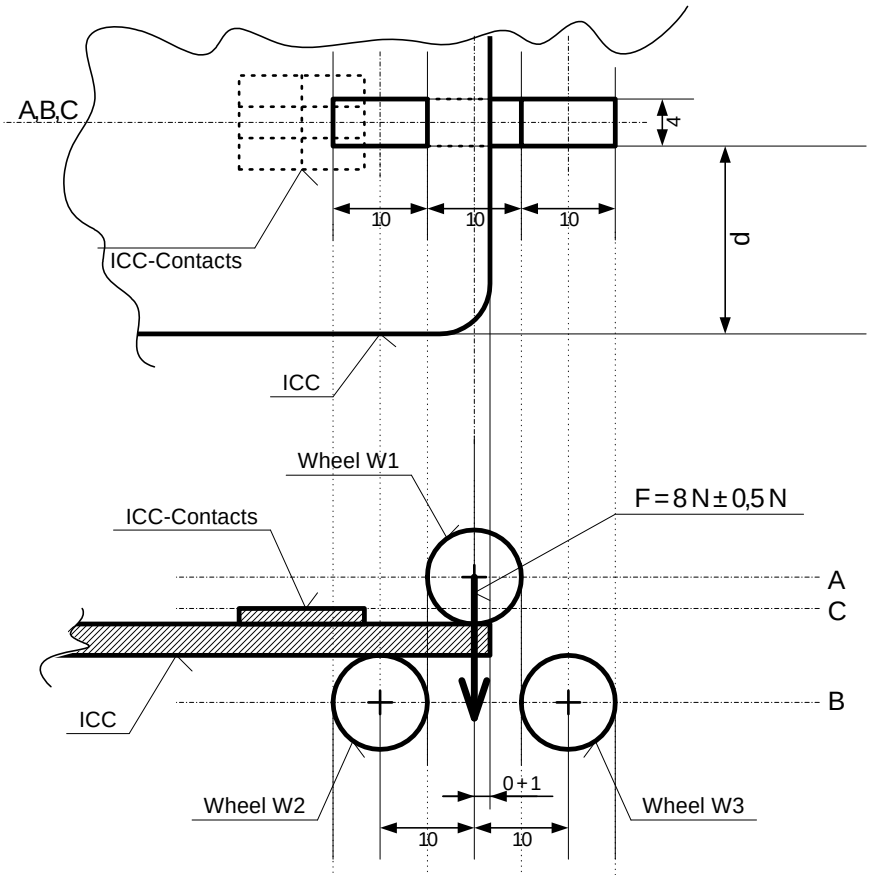


Figure 10 - Location of the wheels and initial position of the ICC

The method by which the ICC is held in position shall be such that it does not prevent deformation of the ICC during testing.

The wheels shall have a standard chamfer and run on low-friction bearings, e.g. ball bearings.

NOTE 1 The following ball bearing definitions define suitable wheels: ISO 623ZZ, e.g. "radiospares" ref=747-721 or NMB=DDR 1030 ZZ RAS or AISI440C.

The part of the ICC moving over W2 shall be free to bend.

Dimension *d* in Figure 10 shall be such that the distance between the centerline axis of the contacts present on the ICC (axis C in Figure 10 and Figure 11) and the plane defined by the centerline axes of the wheel W1 (axis A in Figure 10 and Figure 11), and the wheels W2 and W3 (Axis b in Figure 10 and Figure 11) does not exceed 0,5 mm, measured above and below any of the three wheels.

NOTE 2 “above” and “below” here refer to positions at perpendicular displacements from the plane of the ICC surface.

NOTE 3 Based on an ICC having minimum contacts as defined in ISO/IEC 7816-2:1999, dimension *d* would be:
Contact side facing upwards: 20,62 mm for an ICC with 6 contacts and 21,89 mm for an ICC with 8 contacts.
Contact side facing downwards: 29,36 mm for an ICC with 6 contacts and 28,09 mm for an ICC with 8 contacts.

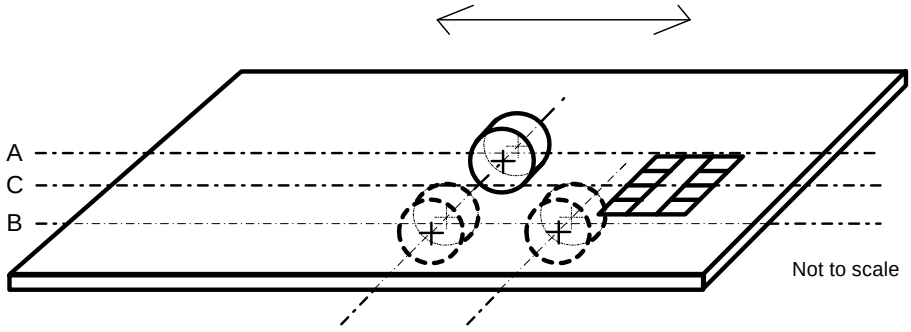


Figure 11 - Location of axes A, B and C

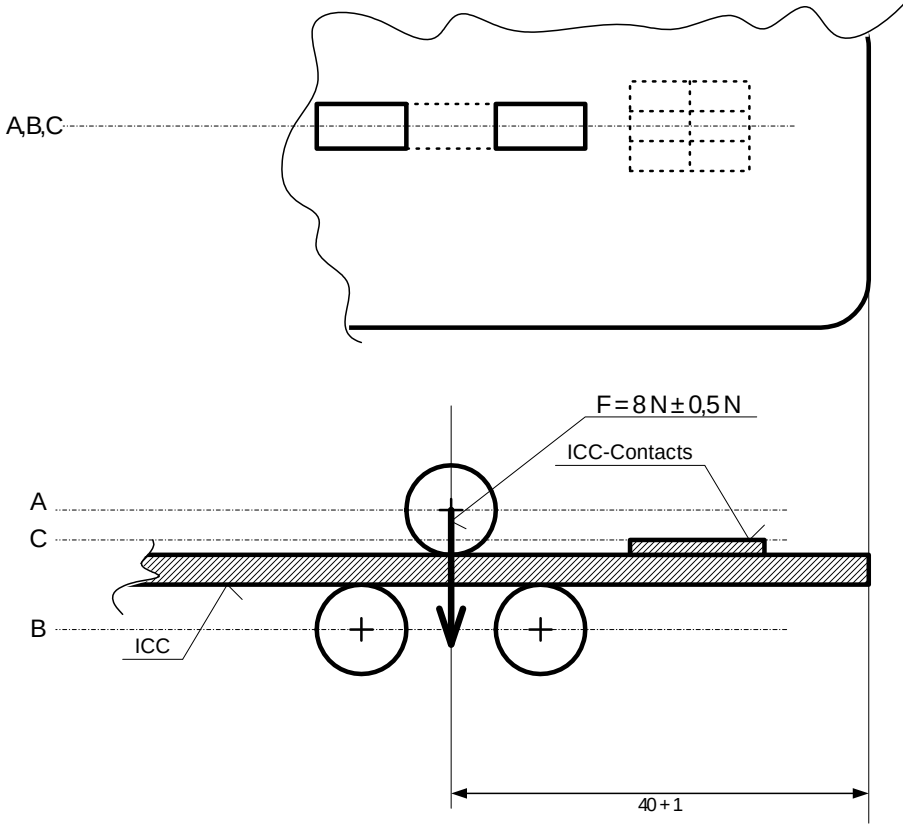


Figure 12 - Inserted position of the ICC

5.22.2 Procedure

During all movements inside the apparatus as described below, the speed of the ICC shall not exceed 100 mm/s.

During all movements the angle between axis C and the plane defined by axis A and axis B shall not exceed 2°.

a) Pre-condition the sample ICC.

b) Verify that the ICC shows an Answer to Reset response conforming to the base standard.

c) Insert the ICC into the apparatus in the initial position with the contacts facing upwards as shown in Figure 10.

d) Move the ICC within the apparatus into the inserted position as shown in Figure 12.

e) Withdraw the ICC to the initial position.

NOTE Steps c) to e) are defined as one cycle.

f) Repeat c) to e) for a total number of cycles defined by the base standard with a frequency of 0,5 Hz. or, if the base standard does not define the number of cycles, for 50 cycles.

g) Insert the ICC into the apparatus in the initial position, but with the contacts facing downwards.

h) Move the ICC within the apparatus into the inserted position.

i) Withdraw the ICC to the initial position.

j) Repeat g) to i) for a total number of cycles defined by the base standard with a frequency of 0,5 Hz. or, if the base standard does not define the number of cycles, for 50 cycles.

l) Check if the ICC shows an Answer to Reset response conforming to the base standard and note the result.

5.22.3 Test Report

The report shall state if the ICC shows an Answer to Reset response, which conforms to the base standard.

NOTE Acceptance Criteria are to be defined by the parties involved.