BS IEC 62908-12-10:2023

BSI Standards Publication

Touch and interactive displays

Part 12-10: Measurement methods of touch displays —
Touch and electrical performance

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National foreword

This British Standard is the UK implementation of IEC 62908-12-10:2023. It supersedes BS IEC 62908-12-10:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/47, Semiconductors.

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INTERNATIONAL STANDARD

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Touch and interactive displays –
Part 12-10: Measurement methods of touch displays – Touch and electrical performance

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CONTENTS

FOREWORD 5
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Measuring conditions 7
4.1 Standard measuring environmental conditions 7
4.2 Standard atmospheric conditions for reference measurements and tests 8
4.3 Standard positioning equipment and setup 8
4.4 Human operator alternative to standard positioning equipment 9
4.5 Test bar and touch pen 10
5 Touch performance measurement methods 11
5.1 General 11
5.2 Accuracy test 11
5.2.1 Purpose 11
5.2.2 Test procedure 11
5.2.3 Report 15
5.3 Repeatability or jitter test 15
5.3.1 Purpose 15
5.3.2 Test procedure 16
5.3.3 Report 18
5.4 Linearity test 18
5.4.1 Purpose 18
5.4.2 Test procedure 18
5.4.3 Report 21
5.5 Reproducibility test 21
5.5.1 Purpose 21
5.5.2 Test procedure 22
5.5.3 Report 23
5.6 Signal-to-noise ratio (SNR) test 24
5.6.1 Purpose 24
5.6.2 Test procedure 25
5.6.3 Report 26
5.7 Report rate test 26
5.7.1 Purpose 26
5.7.2 Test procedure 26
5.7.3 Report 27
5.8 Latency test 27
5.8.1 Purpose 27
5.8.2 Test procedure 27
5.8.3 Report 28
5.9 Electrical noise immunity test 28
5.9.1 Purpose 28
5.9.2 Test procedure 28
5.9.3 Report 29
5.10 Water droplet immunity test 29
5.10.1 Purpose 29
5.10.2 Test procedure 30

AVA Documents
Document Sharing Hub

5.10.3 Report ... 30
5.11 Optical noise immunity test ... 30
5.11.1 Purpose ... 30
5.11.2 Test procedure ... 31
5.11.3 Report ... 31
5.12 Power consumption test ... 31
5.12.1 Purpose ... 31
5.12.2 Test procedure ... 31
5.12.3 Report ... 31
5.13 Perpendicular hover distance test ... 31
5.13.1 Purpose ... 31
5.13.2 Test procedure ... 31
5.13.3 Report ... 32
6 In-plane hovering performance measurement methods ... 32
6.1 General ... 32
6.2 Accuracy test ... 32
6.2.1 Purpose ... 32
6.2.2 Test procedure ... 32
6.2.3 Report ... 35
6.3 Repeatability or jitter test ... 35
6.3.1 Purpose ... 35
6.3.2 Test procedure ... 35
6.3.3 Report ... 38
6.4 Report rate test ... 38
6.4.1 Purpose ... 38
6.4.2 Test procedure ... 38
6.4.3 Report ... 40
Annex A (informative) Electrical performance measurement methods of touch sensors ... 41
A.1 Resistance ... 41
A.1.1 General ... 41
A.1.2 Test samples ... 41
A.1.3 Measurement equipment ... 41
A.1.4 Procedures ... 41
A.1.5 Data analysis ... 42
A.1.6 Report ... 42
A.2 Trans-capacitance ... 42
A.2.1 General ... 42
A.2.2 Test samples ... 42
A.2.3 Measurement equipment ... 42
A.2.4 Procedure ... 42
A.2.5 Data analysis ... 43
A.2.6 Report ... 43
Bibliography ... 44

Figure 1 – Composition of test equipment ... 9
Figure 2 – Concept of performance measurement ... 9
Figure 3 – Example of manual test tool (left), positioning without triggering a touch event (middle) and recording a touch event (right) ... 10

AVA Documents
Document Sharing Hub
Full document details: BS IEC 62908-12-10:2023

Figure 4 – Examples of test bars 11
Figure 5 – Location of edge area and centre area 12
Figure 6 – Point grid 12
Figure 7 – Accuracy definition 13
Figure 8 – Example of measurement result and calculation of accuracy 15
Figure 9 – Repeatability in the touch sensor module 16
Figure 10 – Example of measurement result for repeatability 18
Figure 11 – Dragging line for linearity test 19
Figure 12 – Linearity definition 19
Figure 13 – Example of measurement and calculation of linearity 21
Figure 14 – Example of reproducibility test results 22
Figure 15 – Reproducibility test procedure 23
Figure 16 – Examples of measurements of reproducibility – Velocity dependence 24
Figure 17 – SNR definition concept 25
Figure 18 – Dragging direction for reporting time measurement 26
Figure 19 – Reporting time interval measurement 27
Figure 20 – Latency measurement 27
Figure 21 – Example of the effect of external noise 28
Figure 22 – External noise injection 29
Figure 23 – Report of external noise immunity 29
Figure 24 – Example of water drop effect 30
Figure 25 – Water droplet test procedure 30
Figure 26 – Perpendicular hover distance measurement 32
Figure 27 – Point grid 33
Figure 28 – Accuracy definition for in-plane of XY coordinates on the target projection plane (l) of the active area 33
Figure 29 – Accuracy definition for Z coordinate on the target projection plane (l) of the active area 34
Figure 30 – Repeatability for in-plane of XY coordinates on the target projection plane (l) of the active area 36
Figure 31 – Repeatability for Z coordinate on the target projection plane (l) of the active area 36
Figure 32 – Dragging direction of in-plane for reporting time measurement 39
Figure 33 – Dragging direction of Z-axis for reporting time measurement 39
Figure 34 – Reporting time interval measurement 40
Figure A.1 – Diagrammatic representation of measurement of resistance 42
Figure A.2 – Diagrammatic representation of measurement of capacitance 43

Table 1 – Standard conditions for reference measurements and tests 8
Table A.1 – Specification of LCR impedance meter 41

Documents
Document Sharing Hub

Full document details: BS IEC 62908-12-10:2023

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TOUCH AND INTERACTIVE DISPLAYS –

Part 12-10: Measurement methods of touch displays – Touch and electrical performance

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IEC 62908-12-10 has been prepared by IEC technical committee 110: Electronic displays. It is an International Standard.

This second edition cancels and replaces the first edition published in 2017. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) added hovering performance measurement methods, especially in-plane characteristics at a constant distance from the touch sensor;
b) added pen touch performance.

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The text of this International Standard is based on the following documents:

Draft	Report on voting
110/1434/CDV	110/1480A/RVC

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62908 series, published under the general title *Touch and interactive displays*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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TOUCH AND INTERACTIVE DISPLAYS –

Part 12-10: Measurement methods of touch displays – Touch and electrical performance

1 Scope

This part of IEC 62908 specifies the standard measuring conditions and measurement methods for determining touch and hovering performance of a touch sensor module. This document is applicable to touch sensor modules, where the structural relationship between touch sensor, touch controller, touch sensor module, display panel, touch display panel, and touch display module is defined in IEC 62908-1-2.

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.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 62908-1-2, *Touch and interactive displays – Part 1-2: Generic – Terminology and letter symbols*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1 and IEC 62908-1-2 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

4 Measuring conditions

4.1 Standard measuring environmental conditions

Measurements shall be carried out under the standard environmental conditions:

– temperature: 25 °C ± 3 °C,

– relative humidity: 25 % RH to 85 % RH,

– atmospheric pressure: 86 kPa to 106 kPa.

When different environmental conditions are used, they shall be noted in the measurement report.

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4.2 Standard atmospheric conditions for reference measurements and tests

If the parameters to be measured depend on temperature, pressure and humidity, and their dependence on temperature, pressure and humidity is unknown, the atmospheres to be specified shall be selected from the following values, as shown in Table 1. The selected values shall be noted in the relevant specifications.

Table 1 – Standard conditions for reference measurements and tests

Temperature [a] °C	**Relative humidity** [a, b] % RH	**Air pressure** [a] kPa
(20, 25, 30, and 35) ± 3	45 to 75	86 to 106

[a] Including extreme values.

[b] Absolute humidity ≤ 22 g/m^3.

4.3 Standard positioning equipment and setup

The standard positioning equipment for touch performance shall be the positioning machine equipped with a test bar, a moving arm, and a stage onto which the touch sensor module is placed, as shown in Figure 1. The positioning machine shall move its arm and stage to place the test bar on or over the touch sensor module.

There are three types of positions associated with a given test: target, actual and reported positions. The target position is a desired measurement location in physical space referenced to a fixed datum on or over the touch sensor module surface. The actual position is the actual location of contact or hovering during test, referenced to the same fixed datum, which can differ from the target position due to test bar placement error. The reported position is the location reported by the touch controller.

As shown in Figure 2, the reported positions from the touch controller are analysed to define performance measures with respect to the target positions.

The touch sensor module and the stage shall be aligned correctly while setting up the measurement equipment, because a misalignment between them can introduce coordinate shifts or rotation between the actual touch positions and target positions; each positioning machine has its inherent accuracy, which means that an actual touched position does not coincide with its target position. The performance measurements based on the target positions can include errors due to the accuracy of the positioning machine. The touch sensor module under test shall be attached to the stage and connected to the electrical interface. The test bar of the selected diameter shall be attached to the moving arm. In case of measurement of the pen touch performance, instead of the test bar, a selected touch pen (stylus pen) shall be attached to the moving arm.

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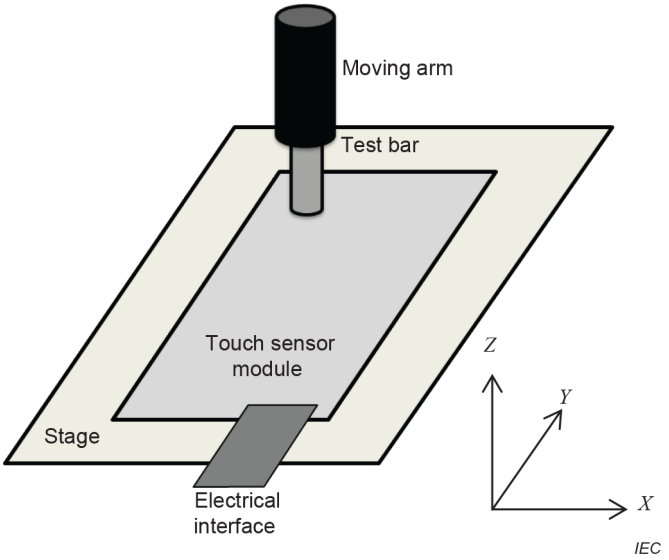

Figure 1 – Composition of test equipment

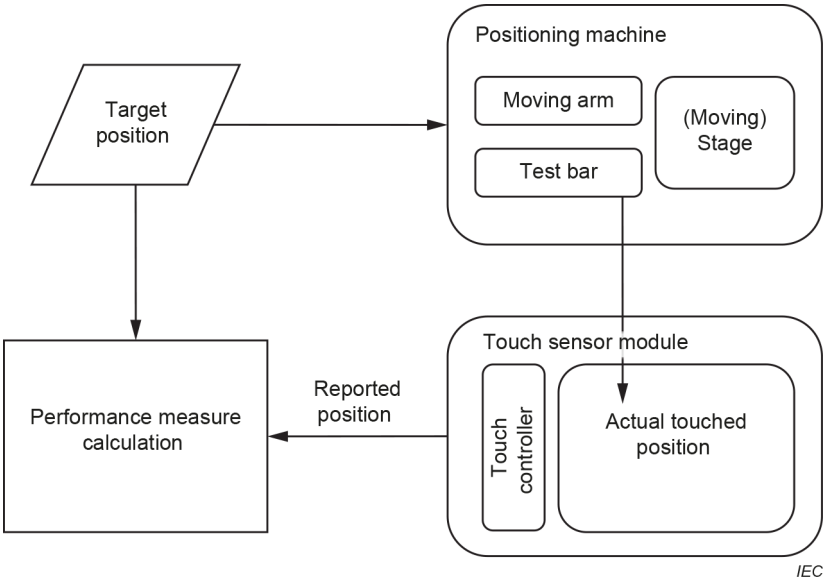

Figure 2 – Concept of performance measurement

4.4 Human operator alternative to standard positioning equipment

Under certain circumstances, for example if the display under test is too large for suitable positioning equipment to be available, a suitably designed test arm may be manually positioned to enable completion of a subset of the tests described in this document. In this situation, the test arm needs to be designed carefully to minimise the reasonable achievable error between actual and target positions when conducting measurements. An example of such a test arm can consist of a rod with a sliding tip (Figure 3, left), whose materials are chosen so that contact between the rod and the display does not trigger a touch event (Figure 3, middle), whereas contact between the sliding tip and the display does trigger a touch event (Figure 3, right). Such a test arm can be placed accurately and reliably by the human operator with the sliding tip away from the display, subsequent to which a measurement can be made by sliding the tip into contact with the display.

The human operator alternative is not recommended for hovering performance measurements because it is difficult to ensure the accuracy of positions, including the height.

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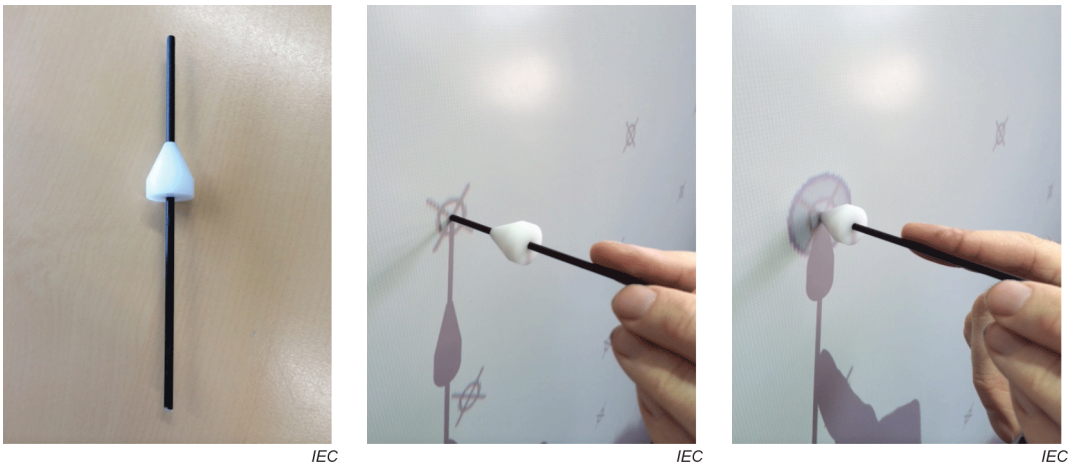

Figure 3 – Example of manual test tool (left), positioning without triggering a touch event (middle) and recording a touch event (right)

4.5 Test bar and touch pen

The parameters of the test bar shall be size, shape, and material. Examples of suitable sizes and shapes of the test bar are shown in Figure 4. The material parameters for the test bar shall be appropriately chosen given the device category under test.

When the touch sensor module is a capacitive touch system, the test bar shall be electrically conductive and shall additionally be grounded in order to avoid potential performance degradation due to electrical noise, unless otherwise stated. A test bar may have an insulating layer on the base to model the effect of a gloved finger.

For reflection-based optical systems, the reflectivity of the contact end of the test bar shall be chosen to be spectrally representative of human skin.

In all cases, the appropriate properties (including size, shape and material) of the test bar shall be reported.

In case of measurement of the pen touch performance, the selected touch pen shall be applied instead of the test bar. The touch pen corresponding to the touch sensor module shall be selected, because there are several types of touch pens (see IEC TR 62908-1-3). The information of the selected touch pen and related properties (i.e., tilt angle of touch pen, pressure of touch pen, etc.) shall be reported.

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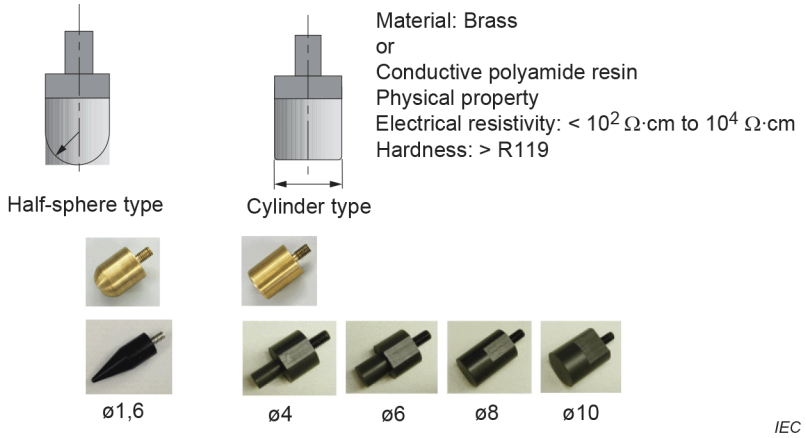

NOTE ø (test bar diameter) = 4 mm, 6 mm, 7 mm, 9 mm, or 12 mm.

Figure 4 – Examples of test bars

5 Touch performance measurement methods

5.1 General

Fundamental touch performance measurement methods are described in Clause 5. They shall be applied during the characterization of a touch sensor module to provide a good user experience. (See Annex A regarding electrical performance measurement methods of touch sensors.)

5.2 Accuracy test

5.2.1 Purpose

The purpose of this test is to measure the ability of touch sensors and modules to indicate how close touch positions are reported relative to their target positions.

5.2.2 Test procedure

5.2.2.1 General

For the accuracy measurement, one of the following two methods can be selected. The first method is a straightforward method to evaluate the distance between each target point and its corresponding reported point. The second method is an indirect method where target grid points are estimated from reported points. This method can tolerate coordinate shifts which are caused by a misalignment between the touch sensor module and the stage while setting up the measurement equipment.

5.2.2.2 Method 1

The active area is defined as the area where touch is recognized. The centre area is defined as the rest of the active area without the edge area as shown in Figure 5. The edge area is defined as an area with the width of W from the edge of the active area. The origin and axis direction shall be defined.

The touch sensor module under test shall be attached to the stage and connected to the electrical interface. The test bar of the selected diameter size, shape and material shall be attached to the moving arm. For a precise measurement of the accuracy, the test equipment should be set up properly. The measurement points in the test grid are evenly spaced along both X and Y axes, away from the origin and spanning the whole active area of the touch sensor panel as shown in Figure 6.

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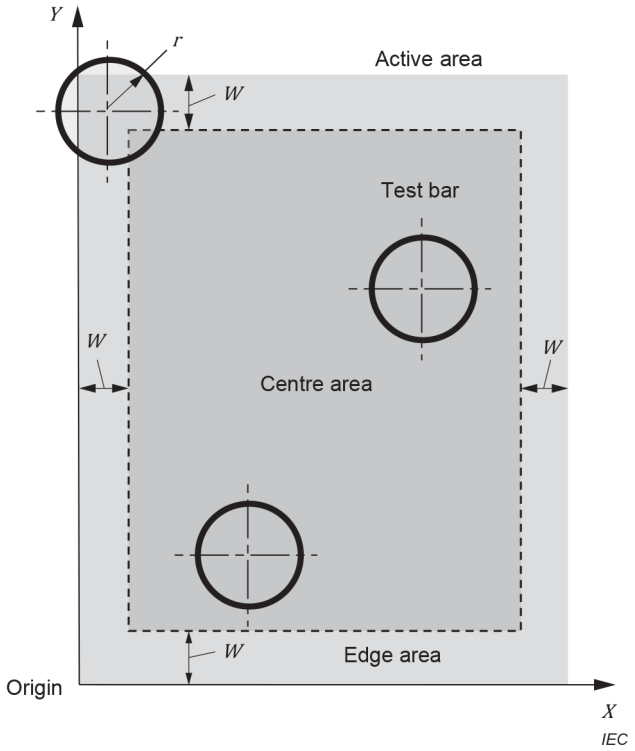
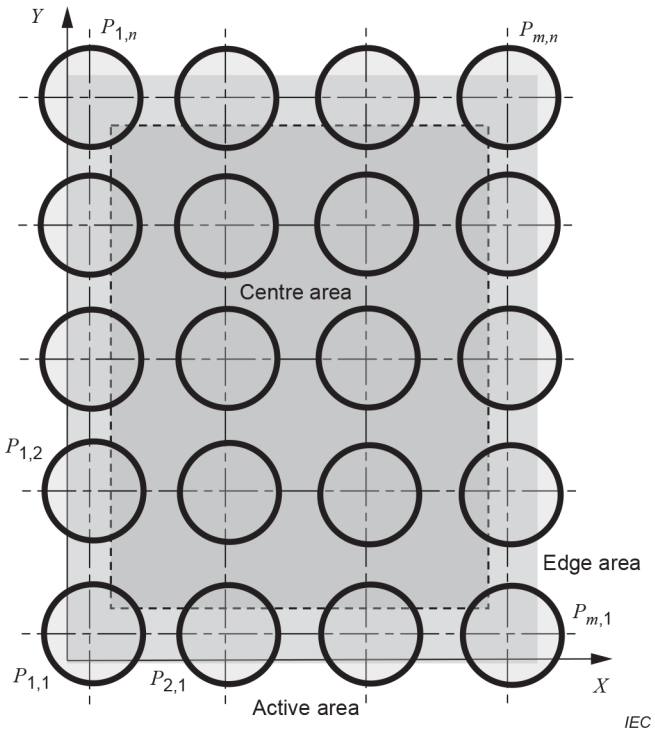


Figure 5 – Location of edge area and centre area



NOTE m, n: number of points in the X and Y direction.

Figure 6 – Point grid

At each target grid point (i, j), lift the test bar down and up, and collect the touch reports p times. As shown in Figure 7, the accuracy is defined as the distance between the target coordinate and the mean reported coordinate.

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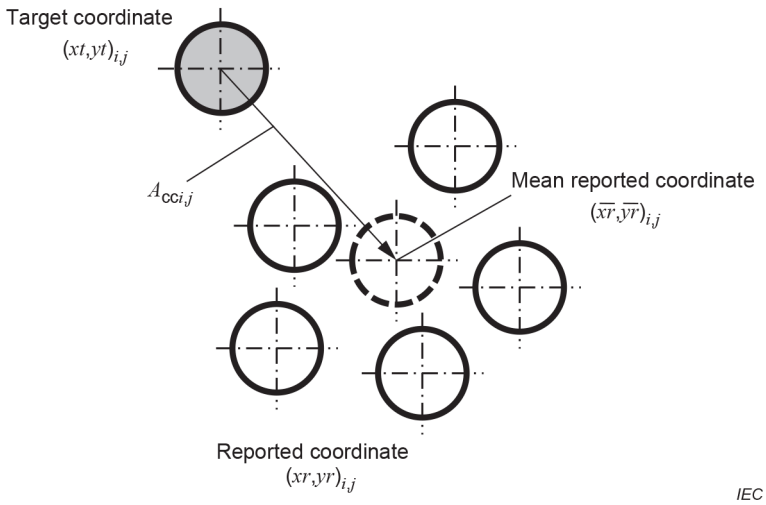

Figure 7 – Accuracy definition

In the centre area, calculate the accuracy, that is, the maximum of accuracy, the standard deviation of accuracy and the average of accuracy, as shown in Formula (1) to Formula (5). In the edge area, the accuracy is calculated in the same manner.

$$A_{\mathrm{ccmax}} = \max(A_{\mathrm{cc}i,j}) \tag{1}$$

$$A_{\mathrm{cc}\sigma} = \sqrt{\frac{\sum_{j=1}^{n}\sum_{i=1}^{m}(A_{\mathrm{cc}i,j} - A_{\mathrm{ccmean}})^2}{q}} \tag{2}$$

$$A_{\mathrm{ccmean}} = \frac{\sum_{j=1}^{n}\sum_{i=1}^{m}(A_{\mathrm{cc}i,j})}{q} \tag{3}$$

$$A_{\mathrm{cc}i,j} = \sqrt{(\overline{xr}_{i,j} - xt_{i,j})^2 + (\overline{yr}_{i,j} - yt_{i,j})^2} \tag{4}$$

$$\overline{xr}_{i,j} = \frac{\sum_{k=1}^{p} xr_{i,j,k}}{p}, \overline{yr}_{i,j} = \frac{\sum_{k=1}^{p} yr_{i,j,k}}{p} \tag{5}$$

where

p	is the number of reports at a target point (1,2,…);
q	is the number of measurement points = m x n;
i, j, k	is the k-th data in number of reports (p) at a target point(i, j);
$A_{\mathrm{cc}i,j}$	is the distance between the target coordinate and the mean reported coordinate;
A_{ccmax}	is the maximum of accuracy;
$A_{\mathrm{cc}\sigma}$	is the standard deviation of accuracy; and
A_{ccmean}	is the average of accuracy.

In case of measurement of the pen touch performance instead of the test bar, the selected touch pen shall be applied.

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