

INTERNATIONAL STANDARD



Printed electronics – **STANDARD PREVIEW**
Part 402-1: Printability – Measurement of qualities – Pattern width
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRINTED ELECTRONICS –

**Part 402-1: Printability – Measurement of qualities –
Pattern width**

FOREWORD

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International Standard IEC 62899-402-1 has been prepared by IEC technical committee 119: Printed electronics.

The text of this standard is based on the following documents:

FDIS	Report on voting
119/133/FDIS	119/143/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62899 series, published under the general title *Printed electronics*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document contains fundamental information on the measurement of printed pattern width in printed electronics. This document includes measurement procedures as well as definitions of pattern width and related attributes such as variation properties of width, which are quite different from those in graphic art printing or the etching process. For example, in graphic art printing, the pattern width is generally more than several millimetres and the variation of width is relatively small and negligible. However, in printed electronics, the printed line patterns, through printing processes such as inkjet, gravure, flexography, etc., can have very narrow width of under several tens of micrometres, and the variation of pattern width can be large due to rough edges, which is hardly observed in the etching process. Therefore, it is difficult to define the line width exactly. The accurate information about pattern width can be very important for control and management of printability in the printing process and this can strongly affect the reliability and performance of printed electronics devices made of several sets of patterns.

This document excludes the standardization of the measurement system. It specifies the properties related to the width of the printed patterns obtained from the optical measurement system.

It is useful to use appropriate software that is capable of image processing, including image conversion, edge detection, calculation of the edge variation, etc., and should include information on the edge detection methods used.

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PRINTED ELECTRONICS –

Part 402-1: Printability – Measurement of qualities – Pattern width

1 Scope

This part of IEC 62899 specifies the measurement methods of the widths of the printed patterns in printed electronics. These printed pattern widths are treated as two-dimensional on a substrate. When the patterns are definitely affected by three-dimensional configurations, these are specified in measurement methods for thickness in printed electronics.

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.

ISO 291, *Plastics – Standard atmospheres for conditioning and testing*

3 Terms and definitions

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

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

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

3.1

stroke width

distance from edge to edge along a line normal to the vertical line of the captured image in the region of interest (ROI)

3.2

pattern width

distance from one edge to the other edge along a line normal to the pattern center line

3.3

pattern center line

approximate center line of two edges obtained from the centers of the stroke widths

3.4

mean pattern width

mean value of the pattern width

3.5

minimum pattern width

minimum value of the pattern width

3.6**maximum pattern width**

maximum value of the pattern width

3.7**inner pattern width**

distance between the inner edge lines which are drawn at the innermost points of the edges

3.8**outer pattern width**

distance between the outer edge lines which are drawn at the outermost points of the edges

3.9**region of interest****ROI**

area (inside defined boundaries) that the user wants to analyse

4 Atmospheric conditions for evaluation and conditioning

The standard atmosphere for evaluation (test and measurement) and storage of the specimen shall be a temperature of (23 ± 2) °C and relative humidity of (50 ± 10) %, conforming to standard atmosphere class 2 specified in ISO 291. For a test piece which is a substrate with printed patterns, the standard atmosphere for evaluation (test and measurement) and storage of the specimen shall be a temperature of (23 ± 1) °C and relative humidity of (50 ± 5) %, conforming to standard atmosphere class 1 specified in ISO 291.

If conditioning is necessary, the same standard atmosphere specified above shall apply.

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5 Measuring methods and instruments**5.1 Measuring instrument**

The measurement of pattern width shall be carried out with an instrument that can obtain the image of patterns. The repeatability and accuracy of the measuring instrument should be less than 10 % of the tolerance specification of the width. From the measurement system, the image of the pattern should be converted to an image file. The image should include the information of pixel size when converted to an image file.

5.2 Preparation of imaging (specimen)

The specimen for measuring pattern width contains the whole image of the pattern in the width direction. The measurer should report the size of the ROI and the resolution of the measurement system.

5.3 Measuring method

For the measurement of the width of the patterns, proper software that can recognize the two edges from patterns of the captured image and calculate the distance between two edges is required. Information on the two edges which border the width of the pattern is required. The required information on edges includes the position difference between two edges. The measurement steps are as follows:

1) Find a region of interest (ROI)

The ROI shall contain the whole pattern in the width direction.

2) Locate the two edges by image capture