

INTERNATIONAL STANDARD



**Printed electronics –
Part 202-8: Materials – Conductive ink – Measurement of difference in resistance
of printing direction of conductive film fabricated with wire-shaped materials**



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CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Test sample, apparatus and measuring device	7
4.1 Measurement environmental conditions	7
4.2 Test apparatus.....	7
4.3 Measuring device.....	7
4.4 Sample preparation for measuring resistance difference with printing direction.....	8
5 Test procedure	9
6 Report	9
6.1 Reporting the resistance	9
6.2 Report of the results	10
Annex A (informative) Measurement of difference of printing direction of printed conductive film.....	11
A.1 Sample preparation.....	11
A.2 Settings for the test sample	11
Bibliography.....	13
Figure 1 – Schematic diagram of printed conductive film with screws for a four-wire measurement.....	8
Figure 2 – Samples with printing direction of conductive film fabricated with wire- shaped materials	9
Figure A.1 – Sample preparation.....	11
Figure A.2 – Holder with setting a test sample	12
Table 1 – Resistance range of the test piece and the applied current.....	8
Table A.1 – Test results	12

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

Draft	Report on voting
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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 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 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

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INTRODUCTION

The printing process for fabricating flexible devices is a very promising technology due to its high conductivity and efficiency. Specifically, a printed metal-based conductive layer on a flexible substrate can be employed as electrode or be interconnected for flexible devices. It can be commercialized as a type of composite material where the conductive layer is formed on the substrate as a conductor.

For metal-based transparent conductive (TC) films, silver or copper nanowires or metal mesh on a flexible substrate are a key component for many recently developed electronic products, ranging from smartphones to keypads of appliances such as refrigerators and washing machines. While indium tin oxide (ITO) is the conventional material for TC films, metal-based TC films fabricated using printed electronics technologies are being increasingly used as an alternative. TC film-fabricated nanowires have superior intrinsic properties owing to their wire shape. Their electrical performance can differ based on the printing direction and ink properties. The alignment of a wire depends on the printing equipment, ink composition, printing process, etc. [1] to [3]¹.

In this document, a method to evaluate the difference in electrical properties based on the printing direction is proposed. In particular, the proposed method monitors changes in the resistance of a printed metal-based TC film on a flexible substrate.

¹ Numbers in square brackets refer to the Bibliography.

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1 Scope

This part of IEC 62899 provides a method for measuring the resistance difference of the printing direction of a printed conductive layer with wire-shaped or wire-type conducting materials. The method described in this document offers a measurement method and conditions for solution processed conductive films, fabricated by coating and printing process.

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 62899-201, *Printed electronics – Part 201: Materials – Substrates*

IEC 62899-202, *Printed electronics – Part 202: Materials – Conductive ink*

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 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>

3.1

conductive material

ingredient of a printing or coating material, which itself is electrically conductive or becomes electrically conductive by post treatment such as heating

Note 1 to entry: The ingredient can be one or more small molecules, precursors, polymers, or particles.

Note 2 to entry: The ingredient might require post treatment to provide electrical conductivity.

[SOURCE: IEC 62899-101:2019, 3.19, modified – the notes have been added.]