IEC 62899-101

Edition 1.0 2019-10

INTERNATIONAL STANDARD

Printed electronics – Part 101: Terminology – Vocabulary

IEC 62899-101:2019-10(en)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC 62899-101

Edition 1.0 2019-10

INTERNATIONAL STANDARD

Printed electronics – Part 101: Terminology – Vocabulary

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 01.040.31

ISBN 978-2-8322-7461-3

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRINTED ELECTRONICS –

Part 101: Terminology – Vocabulary

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62899-101 has been prepared by IEC technical committee 119: Printed Electronics.

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

FDIS	Report on voting
119/279/FDIS	119/285/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "http://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
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Due to the trend towards a globalized, technological and connected society, there is a rising demand for a new breed of technologies enabling low-priced, flexible and new-concept products. Some conventional technologies (including silicon-based microelectronics) have reached their limits due to their high fabrication costs and environmental issues. Armed with new printing technologies and innovative materials, printed electronics has recently emerged as a promising environmentally friendly alternative route for producing electronic products at low cost and with new possibilities of such creative technologies as flexible electronics. Currently, this technology is beginning to be used in the manufacturing of products such as sensors, photovoltaic devices, signage, RFID, batteries, lighting devices, and some parts of display devices, where cost, flexibility and recycling are critical issues.

For successful industrialization of printed electronics, not only the reliability and repeatability in equipment and processes should be provided under global standardization, but also the harmonization of terminology and definitions is a key element for a successful transition of printed electronics to the market.

PRINTED ELECTRONICS –

Part 101: Terminology – Vocabulary

1 Scope

This part of IEC 62899 defines terms used in the field of printed electronics, addressing topics including, but not limited to, materials, printing processes, and print characterization. It focuses on terms that are of particular importance to printed devices. Therefore, terms that are already defined in relation to conventional electronics materials, processes, devices, components or systems that can be used in the field of printed electronics without alteration are not included in this document. Similarly, established terms and definitions in relation to printing technology that apply to the field of printed electronics are not included.

Definitions in this document are the primary reference for printed electronics terminology.

2 Normative references

There are no normative references in this document.

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
1-d qualification feature
feature that is qualified by single directional parameters

3.2
2-d qualification feature
feature that is qualified by area-based qualification parameters

3.3
4-probe measurement
method to measure the resistance of a material while eliminating lead and contact resistance from the measurement result by employing separate pairs of current-carrying and voltage-sensing electrodes

3.4
annealing
<metals> treatment that alters the microstructure of a metal, causing changes in properties such as strength and hardness, in order to induce ductility and to relieve internal stresses

3.5
annealing
<polymers and plastics> treatment that alters the microstructure of a polymer or plastics, causing changes in properties in order to improve strength and hardness, to reduce internal stresses related to the polymer or plastics structure

3.6
annealing
<printed functional material> treatment that can be used to enhance the electrical performance (i.e., to reduce the electrical resistance) of a printed functional material

3.7
arc plasma heating
arc heating utilizing disposable graphite electrodes which generate an arc plasma between the material and electrode, thus transferring the energy to the material

Note 1 to entry: Arc plasma heating captures the arc plasma with a nozzle or gas flow. It can offer higher orientation and higher temperature than does normal arc heating.

3.8
area gain
area of the actual feature that lies outside the nominal feature contour

3.9
area loss
non-printed area of the nominal feature

3.10
basic pattern
set of two-dimensional figures for inspecting the reproducibility of printed patterns, consisting of the evaluation pattern and alignment marks used for accurate positioning of the substrate with respect to the printing apparatus

3.11
bending radius
radius of the curved area in the sample

3.12
bending test
deformation test by application of external stress perpendicular to the plane of a printed element

3.13
blade coating
use of a metal blade offset from the substrate to deposit a material onto the substrate

3.14
cell
basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050-482:2004, 482-01-01, modified – Note omitted.]

3.15
chip
<glass substrates> form of damage in which a small piece of glass has come off the glass surface, for example as a result of impact from a hard object

3.16
conductive film
substrate (sheet or roll) coated with a conductive layer

3.17
conductive ink
fluid in which chemical precursors, polymers, or particles are dissolved or dispersed

Note 1 to entry: Conductive ink becomes an electrically conductive layer after post treatment.

3.18
conductive layer
film-like electrically conductive body made of conductive ink which is printed or coated on a substrate, followed as necessary by post treatment such as heating

3.19
conductive material
ingredient of a printing or coating material, which itself is electrically conductive or becomes electrically conductive by post treatment such as heating

3.20
contact heating
heating process during which a hot object comes in direct contact with materials

3.21
contact printing
printing process that transfers an image from a suitable medium to base materials

3.22
corner rounding
deviation of an actual feature corner from its nominal shape

3.23
crack
<glass substrates> line on the surface of a substrate (e.g. glass) along which it has split without breaking apart

3.24
critical dimension
dimension of a geometrical feature (width of interconnect line, contacts, trenches, etc.) which can be formed during electronic device/circuit manufacturing and can be of interest for further qualification

3.25
cross direction
direction at right angles to the machine direction of a substrate

3.26
cross-sectional qualification feature
feature which can be qualified by cross-sectional qualification parameters

3.27
curing
process during which volatile components evaporate and/or materials undergo chemical reactions to form a continuous bulk material

3.28
cylinder printing
image transfer process in which a substrate and silk screen are indexed across the surface of a rotating cylinder

Note 1 to entry: When printing sheet substrates, the sheet is fixed to the surface of a cylindrical suction roller, and the sheet is printed as the cylinder rotates. The screen mask is the same format as that used for flatbed printing.

3.29
dielectric heating
microwave heating
HF heating
electric heating in which the heat is generated in dielectric and semiconducting loads, under the action of high frequency electric field of a frequency range from 1 MHz to 300 MHz

[SOURCE: IEC 60050-841:2004, 841-28-01, modified – the two terms "microwave heating" and "HF heating" have been added.]

3.30
dielectric strength
maximum electric field an electrically insulating material can sustain without experiencing failure of its insulating properties

Note 1 to entry: Dielectric strength is determined by measuring the minimum applied voltage that results in breakdown (breakdown voltage) and dividing it by the electrode separation distance at the moment of breakdown. Due to possible changes in specimen thickness during the measurement of dielectric strength, alternatively the breakdown voltage and the initial thickness may be specified.

3.31
dispersion
<inks for printed electronics> system consisting of two or more phases one of which is continuous and at least one other is finely dispersed

[SOURCE: ISO 862:1984, 17]

3.32
double-flash mode
mode of inkjet drop analysis where LED or high-power light is quickly flashed twice per jetting event, thereby capturing the same individual drop in two different locations within the camera field of view

3.33
drop analysis
<inkjet printing> method of visualizing or quantifying the motion, trajectory or substrate impact of droplets ejected from an inkjet print head

3.34
drop analysis system
<inkjet printing> imaging-based equipment that can visualize or quantify the motion of inkjet droplets

3.35
drop delivery speed
total distance between the inkjet print-head nozzle plate and the substrate, divided by the time interval between jet triggering and drop arrival