



DPC: 24 / 30483790 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 15 January 2024

Origin: International

Latest date for receipt of comments: 6 March 2024

Project No. 2023/02865

Responsible committee: AMT/9 Printed Electronics

Interested committees:

Title: BS IEC 62899-302-6 Printed electronics

Part 302-6: Equipment - Inkjet - First Drop Measurement

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



119/473/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:

IEC 62899-302-6 ED1

DATE OF CIRCULATION:

2024-01-12

CLOSING DATE FOR VOTING:

2024-04-05

SUPERSEDES DOCUMENTS:

119/396/NP, 119/410A/RVN

IEC TC 119 : PRINTED ELECTRONICS	
SECRETARIAT: Korea, Republic of	SECRETARY: Mr Kyung-Tae Kang
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
☐ SUBMITTED FOR CENELEC PARALLEL VOTING	☒ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

IEC 62899-302-6 ED1 Printed electronics - Part 302-6: Equipment - Inkjet - First Drop Measurement

PROPOSED STABILITY DATE: 2029

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PRINTED ELECTRONICS –

Part 302-6: Equipment – Inkjet – First Drop Measurement

FOREWORD

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- International Standard IEC 6XXXX has been prepared by IEC technical committee 119: MEASUREMENT METHOD OF INKJET DROP DISSIMILARITY, Printed Electronics.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

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/standardsdev/publications.

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

- 97 • reconfirmed,
- 98 • withdrawn,
- 99 • replaced by a revised edition, or
- 100 • amended.

101

INTRODUCTION

Drop-on-demand inkjet printing has been used as a manufacturing tool for printed electronics. The use of inkjet has many advantages since an exact amount of droplet can be deposited on target locations without wasting excessive amount of materials. To position the inkjet head to the printing location, jetting from inkjet head should be paused for a while. As a result, it has been well known that initial first few drops, after the non-jetting pause time, could be different from that of the steady state jetting. The abnormal behaviours of the first few drops may cause serious printing quality problems. Also, it could produce poor yield when used in manufacturing process. So, the proper evaluation of first-drop failures has been important steps for inkjet process development.

Moreover, substrates may need to be unloaded and loaded for printing, especially in printed electronics applications. By using a fiducial camera to view the substrate, the printing target position in the substrate is identified via alignment marks on substrates. Also, the substrate should be aligned with respect to motion stage axes prior to printing. It may take considerable time and the jetting should not occur during the preparation for printing. Due to the non-jetting period, ink on the nozzle surface can dry, and consequently the jetting behaviours of the first few drops are likely to differ from those of steady-state jetting. If the abnormal jetting behaviour is significant, printing quality can be affected accordingly. As a result, a proper measurement method should be developed to evaluate the jetting failure.

The main cause of the first drop behaviour may be from the ink drying on nozzle substrates. However, apart from the ink solidification on substrate, it could be affected by jetting frequency. The piezo type inkjet head uses pressure waves generated inside of head. The first drop is not affected from the residual pressure waves from the previous drops. However, from the second drops, the jetting can be affected by residual pressure waves from the previous jetting. Also, pressure wave amplification is different according to jet frequency due to residual pressure. Thus, the first drop behaviour might be affected. This standard provides the measurement and analysis method for first drop dissimilarity but does not provide the method to decide the cause of the non-similarity of first drops. Nonetheless, by engineering judgement, the causes of first drop dissimilarity can easily be determined.

In order to measure inkjet behaviour, the methods using drop visualization systems based on a LED (light emitting diode) have been standardized. The methods are useful because real-time monitoring is possible by using a CCD (charge-coupled device) camera. However, the method has difficulty and limitations in measuring transient jet behaviour of first few drops because it uses a low-framerate (~30 fps) CCD camera. Nevertheless, the conventional hardware for drop visualization system can be used for first drop measurement by modifying the measurement methods.

In this standard, the measurement method and guideline will be presented including the method using CCD camera illuminated by pulsed light. The other methods are also presented including the methods based on high speed camera as well as printing system. Most printing systems are capable of inspecting printed dots right after printing. Printed patterns can be effectively used for evaluation of first few drops in relations to various parameters.

On the other hand, the price of high speed camera is becoming cheaper and the performance is improving. The hardware requirement and synchronization method is relative simple when the high speed camera is used for measurement. In addition, the method using high speed camera does not require expensive printing system and first drop effects can be effectively analysed.

Each method has merits and limitations and this standard does not recommend specific methods.

The evaluated first drop behaviour can be used for ink development to improve jetting quality. Also, it can be used for process development such as pre-spitting (or pre-jetting) method and head control method (for example, meniscus excitation method).

PRINTED ELECTRONICS –

Part 302-6: Equipment – Inkjet – First Drop Measurement

1 Scope

This document specifies the method for determining inkjet first drop behavior based on either visualized droplet images or printed dots on standard substrate. This measurement standardization is limited to drop on demand type of inkjet and may not be applicable to continuous inkjet. This standard includes the test equipment, printing procedures, and analysis of drop behavior. The standard is limited to printed electronics application and may not be suitable for graphic or other application.

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° 62899-302-1:2017 ED1, *Printed electronics - Part 302-1: Equipment - Inkjet - Imaging based measurement of jetting speed*

IEC° 62899-302-2:2018 ED1, *Printed electronics - Part 302-2: Equipment - Inkjet - Imaging-based measurement of droplet volume*

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

3.1 inkjet first drop

The drop dissimilar behaviour of first few drops after non-jetting period of time.

3.2 pre-jetting (or pre-sptting)

idle jetting of inkjet to help recover normal jetting status after slight non-steady state jetting.

3.3 pre-printing

idle jetting, which is performed on substrate region.

3.4 non-jetting (or pause) time

waiting time between the normal jetting status and the next trigger for inkjet jetting.