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Printed Electronics –
Part 301-3: Equipment – Contact printing – Rigid master – Method to measure the shape errors of printing plate rollers

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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

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

The term "printed electronics" can be easily understood in that this industry involves electronic devices and products that are manufactured by using state-of-the-art printing techniques, otherwise known as additive processes. Printing methods have been widely used in textile and paper type substrates for centuries. In the past, the advent of mass producible printouts had a significant impact on how knowledge is stored, transferred and reproduced. At this current stage of technological development, printing on either rigid or flexible substrates is considered to supplement or replace traditional electronic device manufacturing processes. The difference between media printing and printed electronics stems from the fact that media print is used to convey information for humans to process using their eyes while printed electronics requires machines to process electronic information; the level of resolution and functionality required makes the difference. Some of the widely used functional materials for printed electronics are, but not limited to, nano- or micro-size metal particles, semiconductive polymers, and dielectric materials. Due to the available and required readout resolution, small feature sizes below 20 µm will necessarily be printed. Layer thickness and registration accuracy of printed products are closely related to the quality control of electronic devices with ink materials requiring a high level of quality. Overall, printing tolerance is much smaller in printed electronics.

There are two main categories in the printing process for printed electronics. One is a non-contact printing process, such as inkjet printing or an electrostatic discharge (ESD) printing process. The other is a contact printing process, such as gravure printing, gravure offset printing, reverse offset printing and screen printing. This document provides a proposal for measuring and assessing the printing master. Therefore, the scope is limited to the printing process using the printing master.

The quality of the printing master is important because the ink is transferred from the printing master to the substrate directly in these processes, which means that the quality of the results of the printed circuit depends on the quality of the printing master. For the mass production of printed electronic devices, many companies, such as device manufacturers, printing master manufacturers and printing master manufacturing equipment vendors, are related to manufacturing and thus they will use a printing master and standardized measurement and assessment methods.

Printed electronics requires more precise dimensional control than conventional media printing as mentioned above. It means that the evaluation of printing plate rollers is critical to achieving the reliable production of high-resolution patterns and the reduction of printing registration errors. One of the most important performance parameters of the printing plate roller is the dynamic error in actual printing equipment during actual printing. The dynamic error of the printing plate roller causes the changes in the printing process condition, such as the printing pressure and the synchronization error between the roller and the substrate. Such a dynamic error results in printed linewidth variations and printing registration errors. The dynamic error is the combined results of the shape errors of the printing plate roller, the motion guiding error of the bearing assembly, and the unexpected deformation of the roller by the external load including self-gravity load. To reduce the occurrence of dynamic errors of the printing plate roller, each contributor to the dynamic error of the printing plate roller will be evaluated. For the first step to evaluate the dynamic error of the printing plate roller, this document focuses on measuring the shape errors of the printing plate roller.

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1 Scope

This part of IEC 62899 defines measurement terms and methods related to the shape errors of printing plate rollers. Measurement terms include radius, total run-out, and three kinds of shape errors of printing plate rollers that are axial deviation, radial deviation, and cross-sectional deviation. The remaining shape error excluding the three errors mentioned above is defined as a residual shape error.

This document applies to printing plate rollers with or without patterns while excluding the pattern area for the measurement.

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 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*

ISO 12180-1:2011, *Geometrical product specifications (GPS) – Cylindricity – Part 1: Vocabulary and parameters of cylindrical form*

ISO 12180-2, *Geometrical product specifications (GPS) – Cylindricity – Part 2: Specification operators*

ISO 12181-2, *Geometrical product specifications (GPS) – Roundness – Part 2: Specification operators*