IEC TR 62899-304-2

Edition 1.0 2026-09

TECHNICAL REPORT

Printed electronics -
Part 304-2: Equipment - Sintering - Temperature measurement method for thermal treatment system

ICS 19.080; 37.100.10

ISBN 978-2-8327-1508-6

IEC TR 62899-304-2:2026-09(en)

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The text of this Technical Report is based on the following documents:

Draft	Report on voting
119/578/DTR	119/595/RVDTR

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 Technical Report 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.

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– reconfirmed,

– withdrawn, or

– revised.

INTRODUCTION

Printed electronics (PE) has made significant progress, and its market has expanded considerably. It has numerous applications, including electrical and electronic products, textiles, and healthcare. In particular, conductive ink has the widest range of applications.

The functionality of conductive ink depends on the quality of the conductive layer that is formed by thermal treatment after printing the desired pattern. The thermal treatment process greatly influences the properties of the conductive layer. For example, uneven heating can lead to problems such as uneven conductivity, substrate distortion, and peeling of the conductive layer from the substrate.

To guarantee and reproduce the desired performance of the conductive layer, a stable and evenly distributed thermal treatment process is indispensable. Therefore, close monitoring and management of the temperature during this process are crucial.

This study is expected to serve as a valuable resource for researchers and developers specializing in the thermal treatment process for PE products, highlighting potential issues related to temperature management. Ultimately, it is hoped that this research will provide new insights into improving the thermal treatment process and quality control, thereby contributing to the realization of high performance and reliable printed electronics products.

1 Scope

This part of IEC 62899 provides information on methods for determining the sample temperature during the thermal treatment process in the production of PE products.

This document also compares the characteristics of contact and non-contact temperature measurement methods.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

4 Issues of temperature measurement for thermal treatment

4.1 General

By definition, PE products are manufactured by printing processes. After printing, the characteristics of the items are commonly subjected to other treatment steps, known in the printing industry as post processes. One of these is thermal treatment.

Thermal treatment processes include evaporation, annealing, curing, and sintering, often using heat. The heating sources include resistance heating, infrared radiation, laser, flash lamp, and so on. Depending on whether the sample is stationary or moving, these processes can also be divided into two types: batch and continuous (flow) processes.

A variety of temperature measurement methods can be used according to the nature of the thermal treatment processes.

4.2 Equipment for thermal treatment

A common heating temperature setting is to input the temperature specified in the ink manufacturer's specifications into the equipment. However, this temperature is often not the sample temperature, but rather a specific space temperature within the equipment. In addition, the temperature inside the equipment is not always uniform (see Figure 1 and Figure 2).