INTERNATIONAL STANDARD

ISO 14571

First edition
2020-11

Metallic coatings on non-metallic basis materials — Measurement of coating thickness — Micro-resistivity method

Revêtements métalliques sur matériaux non-métalliques — Mesurage de l'épaisseur des revêtements — Méthode utilisant la micro-résistivité

Reference number
ISO 14571:2020(E)

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Published in Switzerland

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Foreword

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Metallic coatings on non-metallic basis materials — Measurement of coating thickness — Micro-resistivity method

1 Scope

This document specifies a method for non-destructive measurements of the thickness of conductive coatings on non-conductive base materials. This method is based on the principle of the sheet resistivity measurement and is applicable to any conductive coatings and layers of metal and semiconductor materials. In general, the probe has to be adjusted to the conductivity and the thickness of the respective application. However, this document focuses on metallic coatings on non-conductive base materials (e.g. copper on plastic substrates, printed circuit boards).

This method is also applicable to thickness measurements of conductive coatings on conductive base materials, if the resistivity of the coating and the base material is significantly different. However, this case is not considered in this document.

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 terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Measurement principle

The sheet resistivity method uses the so-called “four-point probe” as shown in Figure 1. A row of four spring-loaded metal tips are placed in contact with the surface of the conductive coating. The tip distances between the outer and inner tips, S_1 and S_3, are equal. Usually, a constant current is passed through the two outer contacts (labelled as 1). The introduced current penetrates the conductive material of the coating with the resistivity ρ. The resulting voltage drop is measured across the two inner contacts (labelled as 2).

In general, the flow of the introduced current is non-uniformly distributed over the cross-section of the coating and is not parallel to the coating (see Figure 2). The current density decreases with increasing distance from the direct line between the outer contacts labelled as 1 (with depth and width). If the current is effectively limited by the thickness of the coating, the voltage drop between the inner contacts labelled as 2 is a measure of the thickness.

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