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Textiles — Smart textiles — Test method for sheet resistance of conductive textiles using non-contact type

Textiles — Textiles intelligents — Méthode d'essai de mesurage de la résistance superficielle de textiles conducteurs au moyen d'un capteur de type sans contact

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 38, *Textiles*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 248, *Textiles and textile products,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Conductive fabrics are an important component in the design and manufacture of smart textiles. On the one hand, it is possible to use the non-destructive method for measuring the sheet resistance of fabrics of different construction and thickness described in this document for quality control of the fabrics. On the other hand, it is also suitable for quantitatively determining the sheet resistance of the conductive fabric, which is needed for the design and manufacture of electronic (smart) textile products.

The eddy current method is a method applied for the characterization of electrical properties such as sheet resistance, conductivity and local magnetization. Typically, an alternating electromagnetic field (primary field) is inducing eddy currents in the flat electrically conductive sample of interest. According to Lenz' law, the induced eddy currents generate a secondary electromagnetic field which is opposed to the primary field. The interaction of the primary field with the secondary field is a function of the sheet resistance of the present conductive layers. This principle is applied to electrically characterize layers without establishing an electrical contact. Generally, there are variants of measurements in physical contact and without physical contact of an electrically isolated eddy current sensor. The non-contacting mode allows investigating specimen without any mechanical impact as a potential source of damage or artefacts. It is possible to implement the primary field induction and the resulting field measurement at different positions. The industry is using various probe types and sizes for eddy current testing (see ISO 12718 and ISO 15549).

Textiles — Smart textiles — Test method for sheet resistance of conductive textiles using non-contact type

1 Scope

This document describes the measurement for the determination of the sheet resistance of conductive textile structures or conductive structures by using eddy current technology in reflection mode setup/arrangement.

It is applicable to conductive textile structures or conductive structures intended for application in/to textiles in the form of sheets (woven fabric, knitted fabric, nonwoven, coated fabric) where the area is formed by intersecting surfaces having conductive textile material.

It is also applicable to multilayer structures containing both insulating and conductive layers.

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 139, *Textiles — Standard atmospheres for conditioning and testing*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology database for use in standardization at the following addresses:

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

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

3.1
textile material
material made of textile fibres and intended to be used, as such or in conjunction with other textile or nontextile items, for the production of textile products

Note 1 to entry: textile material refers to linear textile materials (textile yarns) as well as flat textile material (e.g. knitted, woven and nonwoven fabric).

3.2
conductive textile material
textile material (3.1) intended to carry electric current

3.3
conductive fabric
fabric having electrical conductivity

Note 1 to entry: Possible applications for conductive fabrics are as signal line, power transmission line, or electromagnetic shield.

Note 2 to entry: Fabrics are for example of woven, knitted or nonwoven construction.

Note 3 to entry: Highly conductive materials like silver or copper have values for the specific resistance around 10^{-8} Ω m. Conductive fabrics do not reach these low resistance values yet.