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Requirements for Woven and Knitted Electronic Textiles (E-Textiles) Integrated with Conductive Fibers, Conductive Yarns and/or Wires

An international standard developed by IPC

Association Connecting Electronics Industries

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Developed by the E-Textiles Materials Subcommittee (D-72) of the E-Textiles Committee (D-70) of IPC

Users of this publication are encouraged to participate in the development of future revisions.

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Table of Contents

Figures

Tables

Requirements for Woven and Knitted Electronic Textiles (E-Textiles) Integrated with Conductive Fibers, Conductive Yarns and/or Wires

1 SCOPE

This standard establishes the classification system as well as qualification and quality conformance requirements affecting electrical/electronic performance of woven and knitted electronic textiles (e-textiles) integrated with conductive fibers, conductive yarns and/or wires.

This standard does not cover requirements for other types of e-textiles (e.g., nonwovens, coated/plated fabric, laminated, printed, braided, embroidered, etc.). This standard also does not cover non-electronically integrated textiles or nonconductive fibers or yarns.

1.1 Purpose The purpose of this standard is to provide and define test methods and guidance for key characteristics and durability of woven and knitted e-textiles integrated with conductive fibers, conductive yarns and/or wires.

1.2 Classification IPC standards recognize that electrical and electronic assemblies are subject to classifications by intended end-item use. Three general end-product classes have been established to reflect differences in manufacturability, complexity, functional performance requirements, and verification (inspection/test) frequency. It should be recognized that there may be overlaps of equipment between classes.

CLASS 1 General Electronic Products
Includes products suitable for applications where the major requirement is function of the completed assembly.

CLASS 2 Dedicated Service Electronic Products
Includes products where continued performance and extended life is required, and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

CLASS 3 High Performance/Harsh Environment Electronic Products
Includes products where continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh, and the equipment must function when required, such as life support or other critical systems.

1.3 Measurement Units All dimensions and tolerances in this specification are expressed in hard SI (metric) units. Users of this specification are expected to use metric dimensions. All dimensions ≥ 1.0 mm will be expressed in mm. All dimensions < 1.0 mm will be expressed in µm.

1.4 Definition of Requirements The words **shall** or **shall not** are used in the text of this document wherever there is a requirement for materials, preparation, process control or acceptance.

The word should reflects recommendations and is used to reflect general industry practices and procedures for guidance only.

Line drawings and illustrations are depicted herein to assist in the interpretation of the written requirements of this standard. The text takes precedence over the figures.

1.5 Process Control Requirements The primary goal of process control is to continually reduce variation in the processes, products or services to provide products or processes meeting or exceeding user requirements. Process control tools such as IPC-9191 or other user-approved system may be used as guidelines for implementing process control.

A documented process control system, if established, **shall** define process control and corrective action limits.

This may or may not be a statistical process control (SPC) system. The use of SPC is optional and should be based on factors such as design stability, lot size, production quantities and the needs of the manufacturer (see 6.10).

When a decision or requirement is to use a documented process control system, failure to implement process corrective action and/or the use of continually ineffective corrective actions **shall** be grounds for disapproval of the process and associated documentation.