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Guidelines for Design, Selection and Application of Conformal Coatings

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Developed by the Conformal Coating Handbook Task Group (5-33c) of
the Cleaning and Coating Committee (5-30) of IPC

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

Contact:

IPC
3000 Lakeside Drive, Suite 309S
Bannockburn, Illinois
60015-1219
Tel 847 615.7100
Fax 847 615.7105

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Cleaning and Coating Committee	Conformal Coating Handbook Task Group	Technical Liaison of the IPC Board of Directors
Chair Doug O. Pauls Rockwell Collins	Co-Chairs Jason M. Keeping Celestica	Bob Neves Microtek Laboratories
Vice Chair Debora L. Obitz Trace Laboratories - Baltimore	and Amy M. Hagnauer Raytheon Company	
	Vice Chair Fonda B. Wu Raytheon Company	
Conformal Coating Handbook Task Group		
Maria D'Aniello, 3M Canada Company	Jawn Swan, Crystal Mark, Inc.	Eric Moffatt, Elzly Technology Corporation
Larry Ennett, 3M Company	Winn Cannon, Cytec Industries Inc.	Graham Naisbitt, Gen3 Systems Limited
Michele Nelson, 3M Company	Rick Jordan, Cytec Industries Inc.	Richard Davidson, Honeywell Aerospace
Douglas Schueller, AbelConn, LLC	David Corbett, Defense Supply Center Columbus	Richard Rumas, Honeywell Canada
Ross Dillman, ACI/EMPF	Lowell Sherman, Defense Supply Center Columbus	Bob Teegarden, Honeywell International - Torrance
Constantino Gonzalez, ACME Training & Consulting	Henry Sanfey, Delpi Electronics and Services	Matthew Eveline, HumiSeal Division of Chase Corporation
Greg Alexander, Ascentech, LLC	Kati Parks, Dow Corning	Jeffrey Sargeant, HumiSeal Division of Chase Corporation
Thomas Cleere, BAE Systems Platform Solutions	Carlos Montemayor, Dow Corning Corporation	John Waryold, HumiSeal Division of Chase Corporation
Joseph Kane, BAE Systems Platform Solutions	Barry Ritchie, Dow Corning Corporation	Michael McLaughlin, IEC Electronics Corp.
Gerald Leslie Bogert, Bechtel Plant Machinery, Inc.	Jonathan Galaska, Dymax Corporation	Mark Northrup, IEC Electronics Corp.
Barbara Kanegsberg, BFK Solutions	Michael Suwe, ELANTAS Beck GmbH	Jagadeesh Radhakrishnan, Intel Corporation
Edward Kanegsberg, BFK Solutions	Robert Phelps, ELANTAS PDG, INC.	Emmanuelle Guene, Inventec Performance Chemicals
Joseph Riendeau, Boeing Research & Development	James Stockhausen, ELANTAS PDG, INC.	Manfred Suppa, Lackwerke Peters GmbH & Co KG
Thomas Crist, CBC Coating, Inc.	Mark Winkeler, ELANTAS PDG, INC.	Vijay Kumar, Lockheed Martin Missile & Fire Control
Jason Keeping, Celestica	Jade Bridges, Electrolube	Sam Polk, Lockheed Martin Missiles & Fire Control
Louis Bert, Compunetics Inc.	Amanda Stuart, Electrolube	
Laura Note, Continental Automotive Systems	Arthur Perkowski, Electronic Coating Technologies Inc.	
Brian Madsen, Continental Automotive Systems		
Mary Muller, Crane Aerospace & Electronics		

Alisha Amar, Lockheed Martin Space Systems Company	Mradul Mehrotra, Raytheon Missile Systems	Per-Erik Tegehall, Swerea IVF AB
Megan Brecht, Lockheed Martin Space Systems Company	Robert Monier, Raytheon Missile Systems	Rick Carlson, Taiyo America Inc.
Michael Green, Lockheed Martin Space Systems Company	Martin Scionti, Raytheon Missile Systems	Cary Schmidt, Teknetix Inc.
Hue Green, Lockheed Martin Space Systems Company	Nick Webb, Raytheon Missile Systems	Thomas Farrell, Thomas G. Farrell Associates
Dung (Young) Tiet, Lockheed Martin Space Systems Company	Amanda Rickman, Raytheon Systems Company	Renee Michalkiewicz, Trace Laboratories - Baltimore
Dennis Fritz, MacDermid, Inc.	DeAnn Gibbs, Rockwell Collins	Debora Obitz, Trace Laboratories - Baltimore
Albert Mastrangelo, Material Matters International, LLC	Nate Grinvalds, Rockwell Collins	Lee Wilmot, TTM Technologies, Inc.
MaryAnne Mosher, Max Q Systems	Eddie Hofer, Rockwell Collins	Calette Chamness, U.S. Army Aviation & Missile Command
Christopher Hunt, National Physical Laboratory	Douglas Pauls, Rockwell Collins	Bobby Norman, U.S. Army Aviation & Missile Command
Hector Pulido, Nordson ASYMTEK	Debie Vorwald, Rockwell Collins	Sharon Ventress, U.S. Army Aviation & Missile Command
Randy McNutt, Northrop Grumman Corp.	Gordon Sullivan, Royal Adhesives & Sealants	Crystal Vandevan, LLC
Gustavo Arredondo, Para Tech Coating Inc.	Greg Hurst, RSI, Inc.	Andrew Cote, Underwriters Laboratories Inc.
William Yager, Para Tech Coating Inc.	Gaston Hidalgo, Samsung Telecommunications America	Tim Minko, Viasystems Group, Inc.
Richard Litavis, Paradigm Inc.	Yanmei Li, Schlumberger Well Services	Peter Newell, Whirlpool Corporation
Paula Vandenberg, Plasma Ruggedized Solutions	Giovanni Casanova, Schweitzer Engineering Laboratories, Inc.	Lionel Fullwood, WKK Distribution Ltd.
Michah Pledger, Pledger Consulting	Greg Simpson, Schweitzer Engineering Laboratories, Inc.	Jianfeng Liu, ZTE Corporation
Richard Kraszewski, Plexus Corp.	Stephen Craig, Shin-Etsu Silicones of America, Inc.	Zhe (Jacky) Liu, ZTE Corporation
Kirk Van Dreel, Plexus Corp.	Kim Atkins, Specialized Coating Services	Jiamin Zhang, ZTE Corporation
Amy Hagnauer, Raytheon Company	Lamar Young, Specialty Coating Systems Inc.	John Rohlfing
Bill Vuono, Raytheon Company	Del Parrish, STI Electronics, Inc.	David Vaughan
Fonda Wu, Raytheon Company		Tom Walker
Lance Brack, Raytheon Missile Systems		

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Guidelines for Design, Selection and Application of Conformal Coatings

1 PREFACE

1.1 Introduction Conformal coatings are used in conjunction with printed circuit assemblies (PCAs). The designer and the users of conformal coatings for electronics applications should be aware of the properties of various types of conformal coatings and their interactions with PCAs to protect the PCAs in the end-use environment for the design-life of the PCA (or beyond). This document has been written to assist the designers and users of conformal coatings in understanding the characteristics of various coating types, as well as the factors that can modify those properties when the coatings are applied. Understanding and accounting for these materials can ensure the reliability and function of electronics.

1.2 Purpose The purpose of this handbook is to assist the individuals who either make choices regarding conformal coating or who work in coating operations. This handbook represents the compiled knowledge and experience of the IPC Conformal Coating Handbook Task Group. It is not enough to understand the properties of the various conformal coatings; the user needs to understand what is to be achieved by applying the conformal coating and how to verify that the desired results have been realized.

1.3 Scope Conformal coating, for the purpose of this document, is defined as a thin, transparent, polymeric coating that is applied to the surfaces of PCAs to provide protection from the end-use environment. Typical coating thickness ranges from 12.5 μm [0.49 mil] to 200 μm [7.9 mil].

Processing characteristics and curing mechanisms are dependent on the coating chemistries used. The desired performance characteristics of a conformal coating depend on the application and should be considered when selecting coating materials and coating processes. Users are urged to consult the suppliers for detailed technical data.

This guide enables a user to select a conformal coating based on industry experience and pertinent considerations. It is the responsibility of the user to determine the suitability, via appropriate testing, of the selected coating and application method for a particular end use application.

A conformal coating may have several functions depending on the type of application. The most common are:

- a. To inhibit current leakage and short circuit due to humidity and contamination from service environment.
- b. To inhibit corrosion.
- c. To improve fatigue life of solder joints to leadless packages.
- d. To inhibit arcing, corona and St. Elmo's Fire.
- e. To provide mechanical support for small parts that cannot be secured by mechanical means, to prevent damage due to mechanical shock and vibration.

1.4 Classification This standard recognizes 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 producibility, complexity, functional performance requirements and verification (inspection/test) frequency. It should be recognized that there may be overlaps of equipment between classes.

The user is responsible for defining the product class. The product class should be stated in the procurement documentation package.

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 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.