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Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 1: Preparation for a lead-free control plan

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PROCESS MANAGEMENT FOR AVIONICS – AEROSPACE AND DEFENCE ELECTRONIC SYSTEMS CONTAINING LEAD-FREE SOLDER –

Part 1: Preparation for a lead-free control plan

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC/TS 62647-1, which is a technical specification, has been prepared by IEC technical committee 107: Process management for avionics.

This technical specification cancels and replaces IEC/PAS 62647-1 published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to:

a) the addition of requirements for the use of Pb-free solder alloys,

b) the addition of requirements for the use of COTS,

c) the update of Annex B.

The text of this technical specification is originally based on the following document: GEIA-STD-0005-1 Revision A.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
107/159/DTS	107/180/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC/TS 62647 series, published under the general title *Process management for avionics*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The European Union (EU) enacted two directives; 2002/95/EC Restriction of Hazardous Substances (RoHS) and 2002/96/EC Waste Electrical and Electronic Equipment (WEEE) that restrict or eliminate the use of various substances in a variety of products that are put on the market after July 2006. Other countries have also enacted similar legislation. One of the key materials restricted is lead (Pb), which is widely used in electronic solder and electronic piece part terminations. These regional regulations affect the global market place. However, due to the reduced market share of the Aerospace, Defence and High Performance (ADHP) industries, many of the lower tier suppliers to those industries will change their products to serve their primary, non-ADHP markets. Additionally, several United States (US) states have enacted similar “green” laws and many Asian electronics manufacturers have recently announced completely green product lines. Since ADHP is one of the few major industrial sectors that still repair circuit card assemblies (CCAs) and the Pb-free materials and processes are relatively immature and not fully understood, an aerospace-wide approach to their application is desired.

The products of ADHP companies developing and/or managing Pb-free electronics fall into one of the five categories below.

1) Products that have been designed and qualified with traditional tin-lead (SnPb) electronic piece parts, materials, and assembly processes, and that will need to be maintained in the SnPb configuration.
2) Products that have been designed and qualified with traditional SnPb electronic piece parts, materials and assembly processes, and that have incorporated Pb-free electronic piece parts.
3) Products that have been designed and qualified with SnPb materials, and are re-designed and re-qualified with Pb-free materials.
4) Products that have been designed and qualified with Pb-free electronic piece parts, materials, and assembly processes, and that will need to be maintained in the Pb-free configuration.
5) Commercial-off-the-shelf (COTS) assemblies built with Pb-free materials.

The risks with Pb-free technology include:

1) for some service conditions, use of Pb-free solder may compromise electronic interconnection performance due to potential differences in fatigue characteristics under thermal cycling and vibration relative to traditional solders;
2) the use of Pb-free surface finishes such as pure tin can lead to the formation of tin whiskers which in turn can result in various levels of product and system failure; and
3) the use of lead-free technology can result in higher processing temperatures associated with lead-free solders.

PROCESS MANAGEMENT FOR AVIONICS – AEROSPACE AND DEFENCE ELECTRONIC SYSTEMS CONTAINING LEAD-FREE SOLDER –

Part 1: Preparation for a lead-free control plan

1 Scope

This part of the IEC/TS 62647 series defines the objectives of, and requirements for, documenting processes that assure customers and regulatory agencies that ADHP electronic systems containing Pb-free solder, piece parts, and PWBs will satisfy the applicable requirements for performance, reliability, airworthiness, safety, and certifiability throughout the specified life of performance.

This specification aims to communicate requirements for a lead-free control plan (LFCP), hereinafter referred to as the Plan, and to assist the Plan owners in the development of their own Plans. The Plan documents the Plan owner's processes to assure their customers and all other stakeholders that the Plan owner's products will continue to meet their requirements, given the risks stated in the Introduction.

This specification does not contain detailed descriptions of the processes to be documented but lists high-level requirements for such processes, and areas of concern to the ADHP industries that need to be addressed by the processes.

Pb-free risk management should be accomplished through specific requirements added to the Plan owner's existing infrastructure of product management and control.

This specification applies to the ADHP electronics system supply chain.

The control of the Pb-free activities will be accomplished by the Plan owner addressing the requirements of their Customer. These activities include, but are not limited to, those performed by the system integrator, the original equipment manufacturer (OEM), and their respective supply chains, to the lowest level possible. This should be done with the knowledge that, at the component level, the aerospace industry may not have a great influence over those suppliers. In such cases, the Plan owner assumes responsibility.

Some applications may have unique requirements that exceed the scope of this specification. The extended scope should be covered separately.

The requirements of this specification may be tailored to address unique/specific program needs. If tailoring is performed, the user will obtain documented customer concurrence. Annex A provides a tailoring template that may be used.

This document may be used by other high-performance and high-reliability industries, at their discretion.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC/PAS 62647-2[1], *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 2: Mitigation of the deleterious effects of tin*

IEC/TS 62647-2[2], *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 2: Mitigation of deleterious effects of tin*

IEC/PAS 62647-22[3], *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 22: Technical guidelines*

IEC/PAS 62647-23[4], *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder – Part 23: Rework and repair guidance to address the implications of lead-free electronics and mixed assemblies*

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1 This is equivalent to GEIA-STD-0005-2.This will be superseded by IEC/TS 62647-2.

2 To be published. This will supersede IEC/PAS 62647-2.

3 This is equivalent to GEIA-HB-0005-2. It is the intention of the technical committee to supersede this by a future IEC/TS 62647-22.

4 This is equivalent to GEIA-HB-0005-3. It is the intention of the technical committee to supersede this by a future IEC/TS 62647-23.