



TECHNICAL SPECIFICATION

Process management for avionics – Aerospace and defence electronic systems containing lead-free solder –

Part 21: Program management – Systems engineering guidelines for managing the transition to lead-free electronics

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE



ICS 03.100.50; 31.020; 49.060

ISBN 978-2-8322-1019-2

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PROCESS MANAGEMENT FOR AVIONICS –
AEROSPACE AND DEFENCE ELECTRONIC
SYSTEMS CONTAINING LEAD-FREE SOLDER –****Part 21: Program management –
Systems engineering guidelines for managing
the transition to lead-free electronics**

FOREWORD

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The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- 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 62647-21, which is a technical specification, has been prepared by IEC technical committee 107: Process management for avionics.

The text of this technical specification is based on the following documents: IEC/PAS 62647-21 and GEIA-HB-0005-1.

This technical specification cancels and replaces IEC/PAS 62647-21, published in 2011. This edition constitutes a technical revision.

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

- a) Coherence with IEC/TS 62647-1 definitions.
- b) Reference to IEC 62647 documents when already published.

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

Enquiry draft	Report on voting
107/204/DTS	107/215/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 62647 series, published under the general title *Process management for avionics – Aerospace and defence electronic systems containing lead-free solder*, 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.

INTRODUCTION

Due to a variety of real and potential health issues, many constituent materials used in the production of electronic products have come under scrutiny. The European Union (EU) has started a process with 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 produced after July 2006. Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment is an updated / recast version of the Directive 2002/95/EC.

One of the key materials restricted is lead (Pb), which is widely used in electronic solder and electronic piece part terminations. While these regulations may appear to only affect products for sale in the EU, due to the reduced market share of the Aerospace, Defence and High Performance (ADHP) electronics industry, many of the lower tier suppliers have changed their products because their primary market is consumer electronics. Additionally, several U.S. states have enacted similar “green” laws and many Asian electronics manufacturers have recently announced completely green product lines.

Since the ADHP electronics industry is one of the few major industrial sectors that still repair circuit card assemblies (CCAs) and since Pb-free materials and processes are relatively immature and poorly understood, an aerospace-wide approach to the transition was deemed to be highly valuable.

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

Part 21: Program management – Systems engineering guidelines for managing the transition to lead-free electronics

1 Scope

This part of IEC 62647 is designed to assist program management and/or systems engineering management in managing the transition to lead-free (Pb-free) electronics to assure product reliability and performance.

Manufacturers of Aerospace, Defence and High Performance (ADHP) electronics may inadvertently introduce Pb-free elements (including piece part finish, printed wiring board (PWB) or printed circuit board (PCB) finish, or assembly solder) if careful coordination between buyer and supplier is not exercised. For example, piece part manufacturers may not always change part numbers to identify Pb-free finishes, especially if the previous tin-lead (Sn-Pb) finished piece part has been discontinued. Detailed examination of piece parts and documents at receiving inspection, while crucial, may not be sufficient to identify Pb-free piece parts.

NOTE 1 Pb-free technology can impact any program regardless of whether the program itself is exempt or bound by environmental regulations. The industry conversion to Pb-free solder technology may affect an ADHP program in one or both of the following ways:

- 1) if the program is required to implement Pb-free technology (contract requirement, environmental regulation, etc), then the program manager/lead systems engineer will need to assess the impact of in-house transition with respect to design (performance of products using Pb-free) and process (processes to build Pb-free products);
- 2) if the program purchases COTS (commercial-off-the-shelf) items for its products/systems, then there is a very good chance that these items will contain Pb-free solder or Pb-free finishes on parts, printed wiring boards (PWBs), printed circuit boards (PCB), or circuit cards assemblies (CCA).

The basic principles delineated in this document can be used for program management and/or systems engineering management of any aerospace and/or high performance program. The annexes in the document describe tools that can be used in conjunction with this document.

- 1) Annex A describes a matrix of product tier level versus associated risks with respect to a Pb-free transition.
- 2) Annex B contains links to the European Union Directives and Executive Order 13148.
- 3) Annex C contains a general program manager checklist for dealing with Pb-free issues that summarizes the content of this document.
- 4) Annex D contains a general manufacturing process assessment checklist to assess supplier compliance to IEC/TS 62647-1.
- 5) Annex E describes a recommended program language to assure performance, reliability, airworthiness, safety, and certifiability of Pb-free product(s).

This document is designed to assist a program in assuring the performance, reliability, airworthiness, safety, and certifiability of product(s), in accordance with IEC/TS 62647-1. Please note that the program manager and systems engineer (along with their respective organizations), and the appropriate enterprise authority work together in ensuring that all impacts of Pb-free technology insertion are understood and risks mitigated accordingly.

For the purposes of this document, “program management (or manager) and/or systems engineering management (or manager) and/or the appropriate enterprise authority” are defined as “program manager”.

NOTE 2 The implications are that the program manager and systems engineering manager (along with their respective organizations) and the appropriate enterprise authority work together in ensuring that all impacts of Pb-free technology insertion are understood and risks mitigated accordingly.

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/TS 62647-1:2012, *Process management for avionics – Aerospace and defence electronic systems containing lead free solder – Part 1: Preparation for a lead-free control plan*

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