IEC/PAS 62239

Edition 1.0
2001-04

PRE-STANDARD

Electronic component management plans

PUBLICLY AVAILABLE SPECIFICATION

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

Reference number
IEC/PAS 62239

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

ELECTRONIC COMPONENT MANAGEMENT PLANS

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

This PAS Pre-Standard has been published using a rapid procedure as a result of technical consensus at the level of experts working on the subject within the IEC. The normal IEC procedure for the preparation of an International Standard is pursued in parallel and this Pre-Standard will be withdrawn upon publication of the corresponding International Standard.

IEC-PAS 62239 has been processed by IEC technical committee 107: Process management for avionics.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document:
Draft PAS	**Report on voting**
107/2/PAS	107/7/RVD

Full information on the voting for the approval of this PAS Pre-Standard can be found in the report on voting indicated in the above table.

ELECTRONIC COMPONENT MANAGEMENT PLANS

Purpose

This document is intended to help aerospace equipment manufacturers, subcontractors, maintenance facilities, and other aerospace component users develop their own Electronic Component Management Plans (ECMPs), hereinafter also called the Plan. This document states objectives to be accomplished; it does not require specific tasks to be performed, specific data to be collected or reports to be issued. Those who prepare Plans in compliance with this document are encouraged to document processes that are the most effective and efficient for them in accomplishing the objectives of this document. In order to allow flexibility in implementing and updating the documented processes, Plan preparers are encouraged to refer to their own internal process documents instead of including detailed process documentation within their Plans.

This component management document is intended for aerospace users of electronic components. It is not intended for use by the manufacturers of electronic components. Components selected and managed according to the requirements of a Plan compliant to this document may be approved by the concerned parties for the proposed application, and for other applications with equal or less severe requirements.

Organizations that prepare such Plans may prepare a single Plan, and use it for all relevant products supplied by the organization, or may prepare a separate Plan for each relevant product or customer.

1 Scope

This document defines the requirements to assure customers and regulatory agencies that all of the electronic components in the equipment of Electronic Component Management Plan owners are selected and applied in controlled processes; and that the following objectives are accomplished:

- Components are applied properly in the design
- Components are qualified for the intended application
- The quality of every individual component
- Component integrity and compatibility with manufacturing processes
- A process is in place to collect, store, retrieve, analyse, and act upon data related to the component itself, and also relevant component data from equipment design, equipment manufacturing, and component use in service
- Components are selected, substituted, and managed systematically by the equipment supplier to maintain a traceable path to the qualified equipment through the operation of an effective configuration control system
- Component availability, obsolescence and reliability are understood, and their impacts on the application are understood and managed

2 References

2.1 Normative References

2.2 Informative References

AS 9000 Aerospace Basic Quality System Standard, Appendix 1 Revised 1998, Society of Automotive Engineers

BSI PD6503 (1990) Toxicity of Combustion Products

BSI BS EN 190000 Harmonised System of Quality Assurance for Electronic Components, Generic Specification Monolithic Integrated Circuits

CDF-AEC Q100 Stress Test Qualification for Automotive-Grade Integrated Circuits, Chrysler-Delco-Ford Automotive Electronics Council

CDF-AEC Q101 Stress Test Qualification for Automotive-Grade Discrete Semiconductors, Chrysler-Delco-Ford Automotive Electronics Council

CDF-AEC Q200 Stress Test Qualification for Automotive-Grade Passive Components, Chrysler-Delco-Ford Automotive Electronics Council

CECC EN 190000 Harmonised System of Quality Assurance for Electronic Components General Specification Monolithic Integrated Circuits

CECC 00114 Rules of Procedure Quality Assessment Procedures

EIA JESD22-A112-A JEDEC Standard –Test Method A112-A, Moisture Induced Stress Sensitivity for Plastic Surface Mount Devices

EIA JESD22-A113-B (1999) Test Method A113-B Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing

EN 100015-1 (1992) Basic Specification: Protection of Electrostatic Sensitive Devices - Part 1: General Requirements

EN 100015-2 (1993) Basic Specification: Protection of Electrostatic Sensitive Devices - Part 2: Requirements for Low Humidity Conditions

EN 100015-3 (1993) Basic Specification: Protection of Electrostatic Sensitive Devices - Part 3: Requirements for Clean Room Areas

EN 100015-4 (1993) Basic Specification: Protection of Electrostatic Sensitive Devices - Part 4: Requirements for High-Voltage Environments

EN 100114-1 (1996) Rules of Procedure 14: Quality Assessment Procedures – Part 1: CECC Requirements for the Approval of an Organisation

EN 100114-6 (1996) Rules of Procedure 14: Quality Assessment Procedures – Part 6: Technology Approval of Electronic Component Manufacturers

EN ISO 9000-1 (1994) Quality Management and Quality Assurance Standards – Part 1: Guidelines for Selection and Use

EN ISO 9000-2	(1997) Quality Management and Quality Assurance Standards – Part 2: Generic Guidelines for the Application of ISO 9001, ISO 9002 and ISO 9003
EN ISO 9000-3	(1997) Quality Management and Quality Assurance Standards – Part 3: Guidelines for the Application of ISO 9001:1994 to the Development, Supply, Installation and Maintenance of Computer Software
EN ISO 9000-4	(1993) Quality Management and Quality Assurance Standards – Part 4: Guide to Dependability Program Management. IEC/CEI 300-1
IEC 107/3/PAS	IEC PAS Pre-Standard 62240 Avionics Industry: Use of Semiconductor Devices Outside Manufacturers' Specified Temperature Ranges
IEC 107/4/PAS	Avionics Industry: Reliability Assessment of Electronic Equipment
IEC QC 001002-3	Rules of Procedure, Part 3: Approval procedures
IEC QC001004	Specification List
IEC 47A/532/CD	(1998) [Draft] Integrated Circuits, Measurement of Electromagnetic Emissions, 150 KHz to 1 GHz (IEC Project No 61967)
IEC 61340-5-1	(1998) Electrostatics – Part 5-1: Protection of Electronic Devices from Electrostatic Phenomena – General Requirements
IEC 61340-5-2	(1999) Electrostatics – Part 5-1: Protection of Electronic Devices from Electrostatic Phenomena – User Guide
IPC/JEDEC J-STD-020A	(1999) Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices
ISO 9000	Quality Management and Quality Assurance Standards
ISO 9001	Quality Systems – Model for Quality Assurance in Design, Development, Production, Installation and Servicing
MIL-PRF-38535	Microcircuit Manufacturing, General Requirements for
MIL-STD-883	Test Method Standards, Microcircuits
MIL-PRF-19500	Semiconductor Devices, General Specification for
QS 9000	Quality System Requirements – Automotive Industry
S0001	General Requirements for Integrated Circuits, Stack International

3 Terms and Definitions

Airborne equipment environment is the applicable environmental conditions (as described per the equipment specification) that the equipment shall be able to withstand without loss or degradation in equipment performance during all of its manufacturing cycle and service life.

Capable is a term used to indicate that a component can be used successfully in the intended application.

Certified indicates compliance to an applicable government standard, an applicable industry consensus standard, or the component manufacturer's documented, equivalent internal standard.

Characterization is a process of testing a sample of components to determine the key electrical parameter values that can be expected of all produced components of the type tested.

Component application is the process that assures that the component meets the design requirements of the equipment in which it is used.

Component manufacturer is the organization responsible for the component specification and its production.

Component obsolescence management is the range of management actions taken to avoid or resolve the effects of components not being procurable due to the manufacturer(s) ceasing production. Component obsolescence management should be considered an element of risk management. (See risk management.)

Component qualification is the process used to demonstrate that the component is capable of meeting its specification in all the required environments.

Component quality assurance is all activities and processes to provide adequate confidence that each individual component is free of defects.

Component selection is the process of choosing a specific component for a specific application.

Dependability is the measure of being dependable through meeting reliability, maintainability or survivability expectations.

Distributor is an organization contractually authorized by a manufacturer to store, split, repack and distribute completely finished components which have been declared by the manufacturer as conforming to their specifications. The distributor is responsible for providing any technical information and traceability information supplied by the component manufacturer.

Electronic Component Management Plan (ECMP) is an equipment manufacturer's document that defines the processes and practices for applying components to an equipment or range of equipment. Generally, it addresses all relevant aspects of controlling components during system design, development, production, and post-production support.

Electronic components are electrical or electronic devices that are not subject to disassembly without destruction or impairment of design use. They are sometimes called *electronic parts,* or *piece parts.* Examples are resistors, capacitors, diodes, integrated circuits, hybrids, application specific integrated circuits, wound components and relays.

Electronic equipment is an item produced by the Plan owner, which incorporates electronic components. Examples are end items, sub-assemblies, line-replaceable units and shop-replaceable units.

May indicates a course of action which is permissible within the limits of this document.

Normative reference is a reference for which compliance is required by this document.

Informative reference is a reference that is for information only, and compliance is not required by this document.

Obsolete component is a component which is no longer manufactured, and may or may not still be available.

Risk is a measure of the potential inability to achieve overall program objectives within defined cost, schedule, and technical constraints. Risk has two components: (1) the probability (or likelihood) of failing to achieve a particular outcome, and (2) the consequences (or impact) of failing to achieve that outcome.

Risk management is the act or practice of dealing with risk. It includes planning for risk, assessing (identifying and analyzing) risk areas, developing risk-handling options, monitoring risks to determine how risks have changed, and documenting the overall risk management program. (See Risk.)

Shall indicates a requirement.

Should offers a guideline or recommendation that might be used or helpful to assure compliance to an objective.

Single event effect is the radiation response of a component caused by the impact of galactic cosmic rays, solar enhanced particles and/or energetic neutrons and protons. The range of responses can include both non-destructive (e.g. upset) and destructive (e.g. latch-up or gate rupture) phenomena.

Subcontractor is a person or entity to whom the holder of obligations under a contract has delegated part or all of such obligations.

Substitute or *substitute component* is a component used as a replacement in equipment after the equipment design has been approved. (In some contexts, the term "alternate component" is used to describe a substitute component that is "equal to or better than" the original component.)

Will expresses a declaration of intent when used in the context of being compliant to this document or to an ECMP.

4 Technical Requirements

The Plan ***shall*** document the processes used by the Plan owner to accomplish the objectives listed in clause 1 of this document. The Plan ***shall*** state clearly, concisely, and unambiguously:

- What the Plan owner does to accomplish each of the objectives;
- How compliance to the Plan is demonstrated; and
- The evidence that is available to show that the objectives have been accomplished.

The Plan ***shall*** document the processes used to address each of the requirements of this clause.

Where specific objectives of clause 1 do not apply, the Plan owner may, with appropriate justification, amend the list of objectives in clause 1 by adding, deleting, or modifying objectives. If this is done, the Plan ***shall*** be assessed according to the amended list of objectives, as stated in the Plan.

If the Plan owner obtains components from a distributor or other third party source, the relevant requirements of this document ***shall*** apply also to that source. The following requirements apply to all electronic components, including commercial-off-the shelf (COTS), which are defined by the component manufacturer data sheet, and custom, which are defined by the design holder specification.

The selected components ***shall*** fulfill all functional requirements and parameters, as specified and required for the overall environment and mission profile (thermal, mechanical, radiation, etc.) for all their forecasted life.

The conditions for use of the component ***shall*** be adequately identified, from the component specification based on the component manufacturer's data sheet and any additional requirements to ensure suitability in the end application. Availability and level of obsolescence risk ***shall*** be considered as a major component selection criterion.

4.1 Component Application

Listed here are some categories of component application processes that may be documented in a Plan. Not all of the categories listed below are relevant to every component application; therefore, the requirements listed below are applicable only if relevant to the given application.

4.1.1 Functionality

The documented processes ***shall*** verify that the selected components satisfy the functional requirements for each application.

Note: Examples of these processes include analysis, modelling, simulation, and testing. If software is used for any of these processes, it should be described briefly.

4.1.2 Electromagnetic Compatibility

The documented processes ***shall*** verify that the component is capable of electromagnetic compatibility (EMC) compliance at the equipment level.

Note: Certain components, e.g., high-power switching devices, may generate stronger electromagnetic signals than others, and some components are more susceptible than others to electromagnetic interference. IEC 47A/532/NP addresses this in more detail.

Note: EMC compatibility may be demonstrated by analysis, testing, and simulation.

4.1.3 De-rating and Stress Analysis

The documented processes ***shall*** define the limits within which the component is used, and the methods and criteria used to determine those limits.

The documented processes ***shall*** verify that the component is used within the limits defined above.

All instances in which a component is not used within the limits defined above ***shall*** be documented in the design records. In all such instances, either corrective action ***shall*** be taken, or justification for not satisfying the criteria ***shall*** be documented.

> Note: Typically, the component manufacture provides derating criteria and methods, and they should be used where applicable. If the component manufacturer does not provide this information, or if it is not applicable, then the Plan owner should develop and document them.

4.1.4 Thermal Analysis

The documented processes ***shall*** verify that the component is used within the temperature limits specified by the component manufacturer, or by the Plan owner.

If the component is not used within the temperature limits specified by the component manufacturer, then the processes of IEC CA-AWG/2/DC ***shall*** be followed.

> Note: A common maximum temperature for semiconductor devices is the junction temperature. In some instances for semiconductor devices, and for other types of components, other temperatures may be specified.

> Note: In some instances, the maximum temperature may not be specified by the manufacturer. In such instances, the maximum temperature may be calculated from other information supplied by the component manufacturer.

> Note: Verification processes may include analysis, modelling, thermal survey, simulation, or testing.

4.1.5 Mechanical Analysis

The documented processes ***shall*** verify that the component is mechanically compatible with the application. This includes mechanical fit, as well as the ability to withstand vibration, mechanical shock, mechanical stresses generated by mismatches of coefficients of thermal expansion of the different materials, and other mechanical stresses.

Note: Verification processes may include analysis, modeling, simulation, or testing.

4.1.6 Producibility

The documented processes ***shall*** verify that the component is useable in the production cycle of the equipment, in an efficient manner, without detrimental effects on the component.

4.1.7 Testing, Testability, and Maintainability

The documented processes ***shall*** assure testability of the equipment.

> Note: The focus here is on testing and testability with regard to component verification, not on software or system verification. Examples include board level or sub-assembly level testing, provision for test pins, and that other equipment level tests will be available to verify component function at the appropriate level. Exhaustive testing of complex components is not always realistic, but documented processes should assure some level of evaluation of all components at appropriate points in the production flow.