IPC-J-STD-004C

Requirements for Soldering Fluxes

A standard developed by the Flux Specifications Task Group (5-24a) of the Assembly and Joining Processes Committee (5-20) of IPC

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

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1 SCOPE

This standard prescribes general requirements for the classification and characterization of fluxes for high quality solder interconnections. This standard may be used for quality control and procurement purposes.

1.1 Purpose The purpose of this standard is to classify and characterize Sn-Pb and Pb-free soldering flux materials for use in electronic metallurgical interconnections for printed circuit board assembly. Soldering flux materials include the following: liquid flux, paste flux, solder paste, solder cream as well as flux-coated and flux-cored solder wires and preforms. It is not the intent of this standard to exclude any acceptable flux or soldering material; however, these materials must produce the desired electrical and metallurgical interconnection.

1.2 Classification

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 and bracketed soft imperial [inch] units. Users of this specification are expected to use metric dimensions. All dimensions ≥ 1 mm [0.0394 in] will be expressed in millimeters and inches. All dimensions < 1 mm [0.0394 in] will be expressed in micrometers and microinches.

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, JESD557 or other User-approved system may be used as guidelines for implementing process control.

Manufacturers of Class 3 products **shall** develop and implement a documented process control system.

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 system. The use of "statistical process control" (SPC) is optional and should be based on factors such as design stability, lot size, production quantities, and the needs of the Manufacturer, see 4.6.

Process control methodologies **shall** be used in the planning, implementation and evaluation of the manufacturing processes used to produce soldered electrical and electronic assemblies. The philosophy, implementation strategies, tools and techniques may be applied in different sequences depending on the specific company, operation, or variable under consideration to relate process control and capability to end product requirements.

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 would be grounds for disapproval of the process and associated documentation.

1.6 Order of Precedence The contract takes precedence over this Standard, referenced standards and drawings.

In the event of conflict, the following order of precedence applies:

1) Procurement as agreed and documented between customer and supplier.
2) Master drawing reflecting the customer's detailed requirements.
3) When invoked by the customer or per contractual agreement, this standard..

When documents other than this standard are cited, the order of precedence would be defined in the procurement documents.

The User has the opportunity to specify alternate acceptance criteria.

1.6.1 Conflict In the event of conflict between the requirements of this standard and the applicable drawing(s) and documentation, the applicable user-approved drawing(s) and documentation govern.

Some examples of documentation include the contract, purchase order, technical data package, engineering specification or performance specification. In the event of a conflict between the text of this standard and the applicable documents cited herein, the text of this standard takes precedence. In the event of conflict between the requirements of this standard and drawing(s) and documentation that has not been user approved, this standard governs.

1.6.2 Clause References When a clause in this document is referenced its subordinate clauses apply, unless the requirement references specific subordinate clauses.

1.6.3 Appendices Appendices to this standard are not binding requirements unless separately and specifically required by this standard, the applicable contracts, assembly drawing(s), documentation or purchase orders. Appendices provide further information or refer to other sources of information to help explain the document.

1.6.3.1 Appendix A Example Qualification Test Report
1.6.3.2 Appendix B Notes
1.6.3.3 Appendix C Abbreviations and Acronyms

1.7 Use of "Lead" For readability and translation, this document uses the noun lead only to describe leads of a component. The metallic element lead is always written as Pb.

1.8 Abbreviations and Acronyms Periodic table elements are abbreviated in the standard. See Appendix C for full spellings of abbreviations (including elements) and acronyms used in this standard.

1.8.1 ECM The acronym ECM stands for Electrochemical Migration. ECM is defined as the growth of conductive metal filaments under the influence of a DC voltage bias where growth is by electro-deposition from a solution containing metal ions that are dissolved from the anode, transported by the electric field and redeposited at the cathode and specifically excludes phenomena such as field induced metal transport in semiconductors and diffusion of the products arising from metallic corrosion.

1.8.2 SIR The acronym SIR stands for Surface Insulation Resistance. SIR is defined as the electrical resistance of an insulating material between a pair of contacts, conductors or grounding devices and that is determined under specified environmental and electrical conditions.

1.9 Terms and Definitions Other than those terms listed below, the definitions of terms used in this standard are in accordance with IPC-T-50.

1.9.1 Halide Halogen ions are known as halides. Specifically, chlorine ion is known as chloride or (Cl-), bromine ion is known as bromide or (Br-), fluorine ion is known as fluoride or (F-), iodine ion is known as iodide or (I-) and halogen compounds that have ionic character are termed halide compounds.

1.9.2 Halogen Halogen is the term for all chlorine (Cl) and/or bromine (Br) in compounds. These two types of compounds are referenced based upon the EN 14582 test method (see 3.4.4).

1.9.3 Low Halogen Flux (Cl and Br) Low halogen materials contain ≤1000 ppm (0.1%) Br, and ≤1000 ppm (0.1%) Cl. Sample preparation should be AABUS.

1.9.4 Resin Flux Primarily composed of synthetic resins and/or natural resins other than rosin types.

1.9.5 Rosin Flux Primarily composed of natural rosin, extracted from the oleoresin of pine trees and refined. The rosins used **shall** have a minimum acid value of 130 as determined per ASTM D-465. A synonym for rosin is colophony.

1.9.6 Supplier The term ''supplier'' is equivalent to the ''manufacturer'' of the flux product. Only the manufacturer (not other intermediate providers, such as wholesalers, distributors, representative firms, etc.) is responsible to qualify the flux product. Therefore, throughout this document, the term ''supplier'' is used.