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IPC-HDBK-005

Guide to Solder Paste Assessment

Developed by the Solder Paste Task Group (5-24b) of the Assembly and Joining Processes Committee (5-20) of IPC

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

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Guide to Solder Paste Assessment

1 SCOPE

This handbook is a companion to the solder paste standard J-STD-005 and should be considered to be a guide to help assess the applicability of a solder paste for its use in surface mount technology (SMT) processes. This document also suggests some test methods that can help with designing and testing solder pastes. It is intended for use by both vendors and users of solder paste.

1.1 Purpose Solder pastes are unique materials, whose performance in a surface mount process depends on a variety of variables, many of them interacting. J-STD-005 provides test methods for classification of solder paste based on the use of a variety of testing techniques. However, these solder paste classifications do not have a direct correlation to identify the type and characteristics of a specific solder paste that is needed in any given SMT assembly process.

This document has been written as a guide to assess the applicability of a solder paste for a specific process, given the tremendous number of permutations of different materials, atmospheres and process variables currently available.

Where appropriate, references are given to papers and documents with further information. Due to the sheer number of possible interacting factors, specific solder paste selection criteria cannot be given. The solder paste selected and the assembly process used will need to form solder connections that meet the requirements of industry standards such as J-STD-001 and/or IPC-A-610.

1.2 Checklist Solder paste vendors often provide practical information about their products. When this information is available much time and money can be saved in qualifying the product's capabilities. The following listings are examples of information that is usually of value to process engineers and designers. Items marked with an asterisk (*) are usually of greatest value.

*Is the paste recommended for use in clean or no-clean processes and is there a recommended cleaning process?
*What is the ideal or recommended reflow profile?
*What is the flux classification per J-STD-004 or equivalent flux standard?

- *What are the results of copper mirror testing?
- *What is the halides content?
- *What percentage of Flux Solids (Non-Volatile Content)?
- *Corrosion
- *Surface Insulation Resistance (SIR)

*What is the characterization of solder paste per J-STD-005?

- *Powder Size
- *Powder Shape
- *Metal Percent
- *Viscosity
- *Slump
- *Solder Ball
- *Tack
- *Wetting

*What is the solder powder alloy designation per J-STD-006?

- Acid Value
- Flux Specific Gravity
- Paste Flux Viscosity
- Visual
- Flux Spread
- Wetting Balance
- Fungus

Does it meet Telcordia (formerly Bellcore) GR-78-CORE requirements?

- Copper Mirror
- Halides by Silver Chromate
- SIR - Electromigration

1.3 Terms and Definitions This handbook uses terms and definitions common to the electronics manufacturing industry and defined in **IPC-T-50** *Terms and Definitions for Interconnecting and Packaging Electronic Circuits.*

1.4 Using Solder Paste Solder paste is the material that provides a wetted solder connection between solderable surfaces. To accomplish that end, it consists of:

- A flux vehicle to break down surface oxides on the surfaces to be wetted, and
- Solder alloy in the form of very small solder balls that will coalesce into a solder connection when reflowed.

To be usable, the solder paste must:

- Have reasonable working life under ambient temperature and humidity conditions.
- Have sufficient surface tension, called tack, to hold the component leads/terminations in position until and during reflow.
- Not contribute to the formation of undesirable solder balls/solder fines on the assembly.