PRODUCT DATA SHEET

WF-9942

Wave Solder Flux

Introduction

WF-9942 is a highly active no-clean wave solder flux designed for use with through-hole and mixed-technology assemblies. It has been effectively used in both tin-lead and lead-free soldering operations. **WF-9942** is a second generation no-clean flux designed to meet the requirements of J-STD-004. Although not specifically designed for lead-free soldering (third generation no-clean) or to the requirements of the later J-STD-004B (fourth generation no-clean), **WF-9942** has been successfully and reliably used to assemble millions of circuit boards for the last 15 years. **WF-9942** exhibits very good SIR and ECM results when tested to the J-STD-004 and Telcordia GR-78 requirements. A rosin-free fourth generation product comparable to the **WF-9942** is Indium Corporation's WF-9958.

Features

- Passes J-STD-004 SIR and ECM requirements for ORL0 and passes Telcordia GR-78 SIR requirements
- Very low solder balling
- Wide process window for soldering larger and/or thick circuit boards
- Can be applied by foam or spray fluxing
- Tested for use with all common lead-free and tin-lead alloys, including SAC305, SAC105, SAC0307, silver-free tin-copper plus additive alloys, such as Indium Corporation's Sn995, 96.5Sn/3.5Ag, 63Sn/37Pb, 60Sn/40Pb, and many others
- Tested compatibility with Hot Air Leveled (HASL), Immersion Silver, Electroless Nickel Immersion Gold (ENIG), and Organically Solder Preserved (OSP) copper surfaces
- Rosin-free for enhanced pin probe testability

Physical Properties

WF-9942 is almost colorless, indicating that it is rosin-free. The solvent blend ensures even distribution of flux solids both during storage and during spray flux deposition. The specific gravity of **WF-9942**, 0.828 @ 25°C, is measurably higher than that of pure isopropyl alcohol. However, in contrast to higher solids content fluxes, specific gravity is not the best method to control the quality of **WF-9942**. This is because flux solids content is relatively low and small amounts of water contamination can confuse specific gravity measurements. While in-process quality control of **WF-9942** is not generally required, the best method is to ensure both solids content and activity level is by acid value titration.

Test	Result
Color	Clear
Specific Gravity @25°C (77°F) @15°C (60°F)	 0.828 0.833
Acid Value mgKOH/g flux	 36
Solids Content	4.37%
Flash Point (°F TCC)	54
J-STD-004A Flux Type	ORL0

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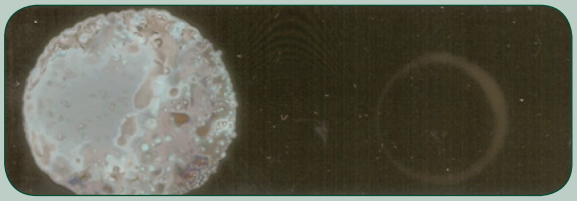
TEST DATA

Copper Mirror

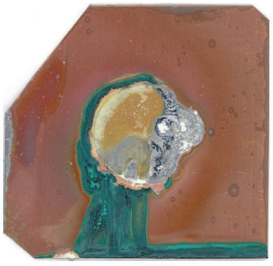


The J-STD-004 copper mirror test is performed per IPC-TM-650 method 2.3.32. To be classified as an "L" type flux, there should be no complete removal of the mirror surface. At the time **WF-9942** was developed, the interpretation of the copper mirror test was somewhat subjective. While the mirror surface is not completely removed in any particular area and there is no complete removal, it is clear that **WF-9942** does remove some of the copper. This is a reflection of **WF-9942** not containing some of the more modern flux ingredients than actual activity.

Copper Corrosion

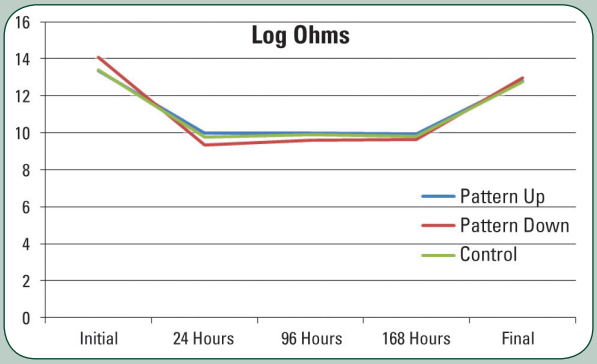
Copper corrosion is tested per IPC-TM-650 method 2.6.15. This test gives an indication of any visible reactions that take place between the flux residue after soldering and copper surface finishes. In particular, green copper corrosion should not be seen. At the time that **WF-9942** was developed, the copper corrosion test was not part of the J-STD-004 battery. Just as with the copper mirror, the lack of rosin and third generation ingredients contribute to some green reaction products after 240 hours. However, the green product is not copper chloride corrosion.

WF-9942 0 Hours



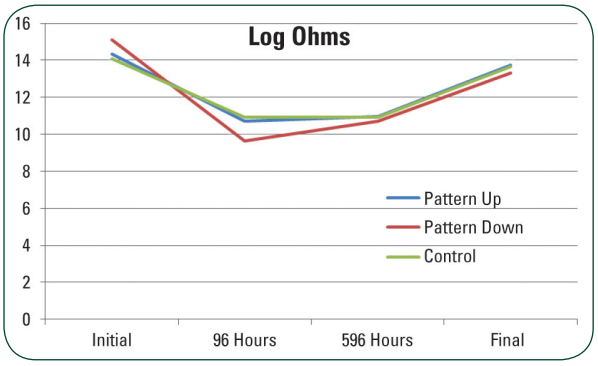
WF-9942 240 Hours

Surface Insulation Resistance (SIR)



The IPC-TM-650 SIR is a 7-day test and gives a general idea of the effect of the flux residue on the electrical properties of the surface of the circuit board. **WF-9942** was tested under the earlier J-STD-004A requirements employing IPC B-24 comb pattern boards. Initial and final resistance readings are taken at ambient temperature and humidity with interim measurements at 24, 96, and 168 hours taken at 85°C and 85% RH. All readings must be above 100 megaohms. **WF-9942** PASSES with little difficulty.

Electromigration (ECM)



WF-9942 was tested using the IPC-TM-650 electromigration test as specified under the earlier IPC-J-STD-004A. It is a 28-day test wherein initial and final measurements on B-25A comb patterns are taken at ambient temperature and humidity and interim measurements are read at 65°C and 88% RH. The 596-hour readings must not drop more than one order of magnitude from the 96-hour readings. As can be seen from the adjacent graph, **WF-9942** PASSES with ease, having the insulation resistance readings actually climb between initial and final measurements.

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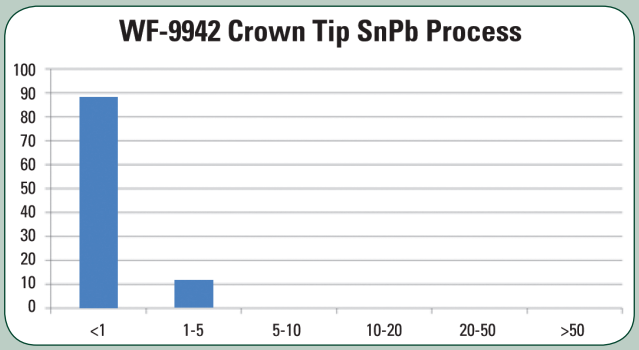
PERFORMANCE AND PROCESS DATA

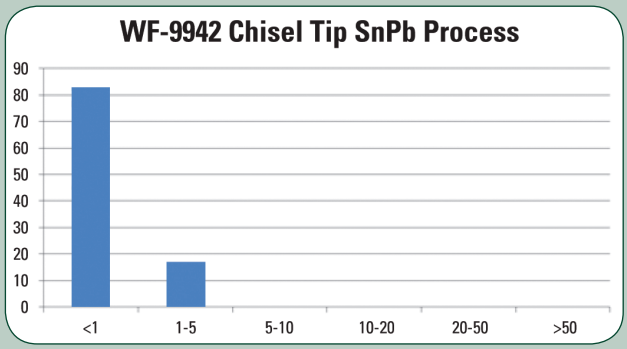
Silver Chromate Halide Test

Prior to the advent of J-STD-004B, the prevalent test for halides/halogens in flux was through the use of silver chromate test paper. A drop of flux is deposited on the paper, and if the paper does not turn white or yellow, it is a confirmation that no halides are present. **WF-9942** PASSES the silver chromate paper test for halides.

Probe Testability

Indium Corporation tests its wave soldering fluxes using a test method based on IPC-9252, employing a 5.5-ounce chisel point test probe, and crown tip probes with more difficult residues. This method measures the electrical resistance encountered by the test probe as a result of the presence of flux residue. **WF-9942** has only been tested after a SnPb reflow process.





Process Recommendations

Indium Corporation tests all of its wave soldering fluxes on its own wave soldering machine prior to making them available to the market.

62mil-thick Circuit Board Process Recommendations

Flux Deposition Rate µg/in² solids	Preheat Temp		Preheat Time (sec)	Alloy	Contact Time (sec)	Pot Temp (°C)
	Top (°C)	Bottom (°C)				
500–1,000	70–110	90–120	50–75	SnPb	1.5–2.0	250–260
1,000–2,000	85–120	85–125	50–75	Pb-Free	3–5	265–270

Shelf Life

The shelf life for this product is **2 years** in an unopened container stored at less than 32.2°C (90°F). Shelf life for an opened container will vary depending on storage conditions, including open time, temperature, and humidity. For longest shelf life of an opened container, replace cap to reduce alcohol evaporation and store in a cool, dry environment.

Residue Removal Recommendations

All of Indium Corporation's no-clean fluxes, including this formula, are designed to be electrically safe under normal consumer electronic and telecommunication operating conditions. Unless otherwise specified, electrically safe means that the post-soldering residues pass J-STD-004A SIR and ECM testing. However, it is understood that some customers desire to remove residues for cosmetic reasons, improved in-circuit testing, improved compatibility with specific conformal coatings, or where the operating parameters of the circuit board may be in extreme conditions for a prolonged period.

If the removal of no-clean flux residues is desired, most commercially available cleaning agents will be effective. Indium Corporation's Technical Support Engineers work closely with cleaning agent vendors and have confirmed flux residue removal capabilities from several vendors using their recommended products and parameters. It is unlikely that users of Indium Corporation's no-clean products will need to change their current residue removal materials and parameters from those currently used. However, when establishing a new process or desiring confirmation of process recommendations, please contact Indium Corporation's Technical Support staff for assistance.

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Indium Corporation Compatible Products

- **Solder Paste**: Indium8.9 or Indium10.1
- **Cored Wire**: CW-807
- **Flux Pen**: NC-771 (rosin-free)

Indium Corporation's wave soldering fluxes have been designed to be fully compatible with our solder paste, cored wire, and rework flux, and are also expected to be compatible with many of our competitors' products. For example, **WF-9942** wave solder flux is not only compatible with Indium8.9HF Solder Paste, but also with our 5.2LS, 8.9 series, 92 series, and 10 series. Indium Corporation determines compatibility primarily by matching flux chemistry. However, a select number of wave, reflow, and rework product combinations have been thoroughly tested to ensure that the combined flux residues meet the electrical and reliability requirements of IPC J-STD-004B.

Health, Safety, Environmental, and Shipping

REACH

No substances of very high concern (SVHC) are used in this product.

Hazard Label

DOT Classification

Transport in accordance with applicable regulations and requirements. UN 1219, isopropyl alcohol, 3, PG II North America Emergency Guide book - Guide #127

Additional Information

WJ-STD-004B is the IPC Joint Industry Standard for classifying and testing soldering fluxes. It varies from the prior versions, J-STD-004 and J-STD-004A, in two very important ways. J-STD-004B uses a modified electromigration (ECM) test battery which is designed to better test the effects of the flux in high-humidity conditions at normal operating temperatures and voltages. The environmental test is specifically designed to try to create dendritic growth and create failure in marginal flux formulas, unlike the prior version of J-STD-004 which used higher temperatures and voltages that did not grow dendrites as easily. Also, J-STD-004B halogen testing now reveals the total amount of halogen in a flux by first using an oxygen bomb to disassociate any halogen from the chemical compounds that they are bound to, and then collecting and quantifying them. Prior versions of J-STD-004 were unable to detect halogens that were present, but only disassociated at high temperatures (such as soldering temperature). As such, prior testing methods might give the user a false sense that no halogens are present in the flux, when in fact they are. Indium Corporation strongly supports the enhanced features of J-STD-004B because it better serves the users' need for information.

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All of Indium Corporation's solder paste and preform manufacturing facilities are IATF 16949:2016 certified. Indium Corporation is an ISO 9001:2015 registered company.