PRODUCT DATA SHEET

WF-9958

Wave Solder Flux

Introduction

Indium Corporation's new **WF-9958** soldering flux is an updated version of Indium's best-selling WF-9942, designed to conform to the more rigorous standards of J-STD-004B Type ORM0. It has no intentionally added halogens, no rosin, and exhibits exceptional hole fill as well as pin-testing performance that can only be achieved with a rosin-free material. In addition to exhibiting excellent soldering performance on a wide range of board finishes and board types, **WF-9958** also passes the updated and more rigorous reliability requirements of the J-STD-004B Surface Insulation Resistance (SIR) and Electromigration (ECM) tests.

Features

- **Halogen-free per J-STD-004B***
  To be halogen-free per J-STD-004B, the formula must contain less than 500ppm of any kind of halogen, ionic or nonionically bonded chlorine, bromine, or fluorine. This is new to J-STD-004B since fluxes that conform to the original J-STD-004 or J-STD-004A may still contain halogens that only disassociate at soldering temperatures, but leave a residue that contains ionic halogen.
- **Light-colored, low-residue, and rosin-free flux and residue for enhanced pin-testing performance**
  Rosin, modified rosins, and resins do contribute to enhanced heat stability for thick or difficult-to-solder boards and for the encapsulation of flux activators. However, the rosins and resins interfere with probe testability.
- **Tested compatibility with Hot Air Solder Leveled (HASL), Immersion Silver, Electroless Nickel Immersion Gold (ENIG), and Organically Solder Preserved (OSP) Copper surfaces.**
- **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.

Physical Properties

Indium Corporation's **WF-9958** flux has almost no color when received in its shipping container. This is because it is anhydrous isopropyl alcohol-based with less than 5% solids and no dark-colored components, such as rosin or modified rosins. Because the flux is anhydrous alcohol-based and has low solids, the specific gravity is very close to that of alcohol and the same flash point as pure isopropyl alcohol. No halogens, ionic or nonionic (as are in some J-STD-004- and J-STD-004A-compliant fluxes), have been added to **WF-9958**. If there are any halogens in **WF-9958**, they are minor contaminants of other components and will not exceed 50ppm of the total flux. Quality control of **WF-9958** during use is generally not required. However, if desired, acid value is the best parameter to monitor, since it will give both an indication of solids content and flux activity.

Test	Result
Color	Clear
Specific Gravity at 25°C (77°F) at 15.5°C (60°F)	 0.798 0.805
Acid Value mgKOH/g flux mgKOH/g flux solids	 28.5 571
Solids Content	4.99
Flash Point	12°C
J-STD-004B Flux Type	ORM0
Total Halogen	<50ppm

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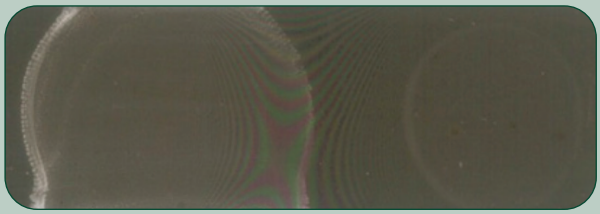
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Test Data

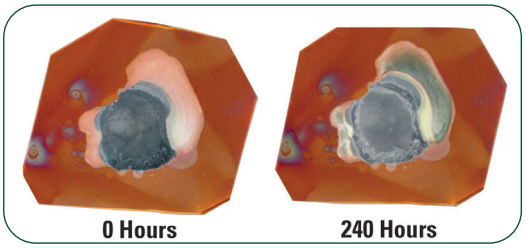
Copper Mirror

The J-STD-004B 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. **WF-9958** shows some minor removal of the copper mirror and is classified as ORM0. This classification is quite common for the more active rosin-free low-solids fluxes, and while the slightly increased activity of the flux helps to achieve greater hole fill and fewer other defects, it does not have a negative effect on the final assembly's reliability.



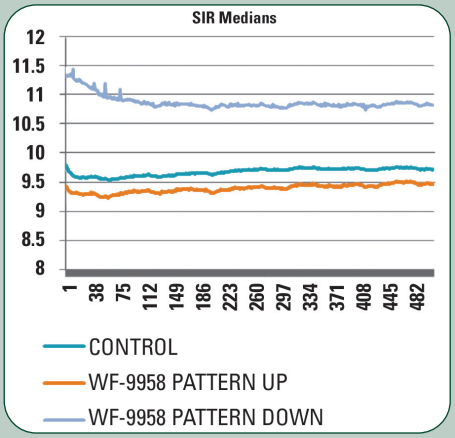
Copper Corrosion

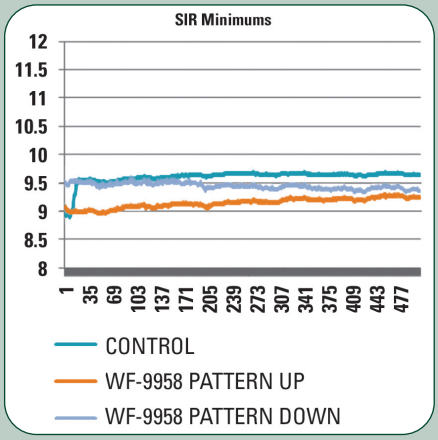
Copper corrosion is tested per IPC-TM-650 method 2.6.15. This test gives an indication of any visible reactions that take place between the flux residue after soldering and copper surface finishes. In particular, green copper corrosion (formed as copper-chloride) should not be seen.



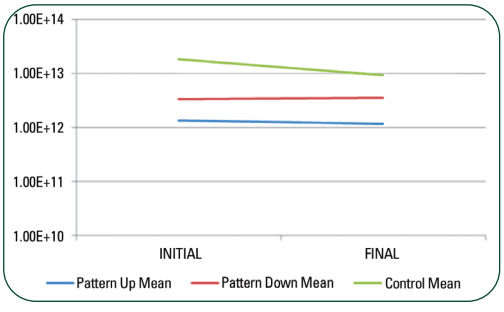
Surface Insulation Resistance (SIR)

The Surface Insulation Resistance test is performed per IPC-TM-650 Method 2.6.3.7, using boards prepared per IPC-TM-650 method 2.6.3.3. All boards soldered with **WF-9958** pass the requirements of having exhibited no dendritic growth, no visible corrosion, and a minimum insulation resistance of 100 megohms (1 x 10^8). The values shown on the two adjacent graphs show the number of Ohms times ten to the power of the vertical axis. 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.





Electromigration (ECM)



The electromigration test is performed to IPC-TM-650 method 2.6.14.1 with boards prepared using IPC-TM-650 method 2.6.3.3. The test conditions for this test are 496 hours at 65°C ±2°C and 88.5% ±3.5% RH. To pass this test, there should be no visible corrosion and no dendritic growth that decreases line spacing by more than 20%. In addition, the insulation resistance should not drop more than one order of magnitude after the first 96-hour stabilization period when a bias voltage is applied.

J-STD-004B SIR Minimum Values		
	Minimum Values	
	Initial	Final
Pattern Up Mean	1.33E+12	1.15E+12
Pattern Down Mean	3.36E+12	3.50E+12
Control Mean	1.83E+13	9.32E+12

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Performance and Process Data

Hole Fill



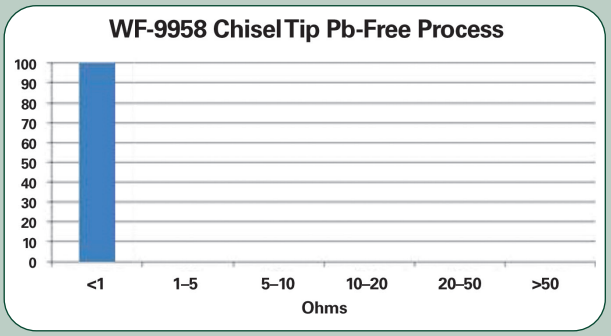
Indium Corporation uses several of its own tests, based on IPC workmanship standards, for determining hole fill. Depending on the design criteria for the flux, Indium Corporation uses holes of varying sizes and circuit board finishes. However, we always look for 100% hole fill, even though the IPC recognizes that a smaller degree of hole fill is acceptable for its workmanship standards. Testing is typically performed with both lead-free (Indium Corporation's Sn995 alloy) and tin-lead (63Sn/37Pb) solders.

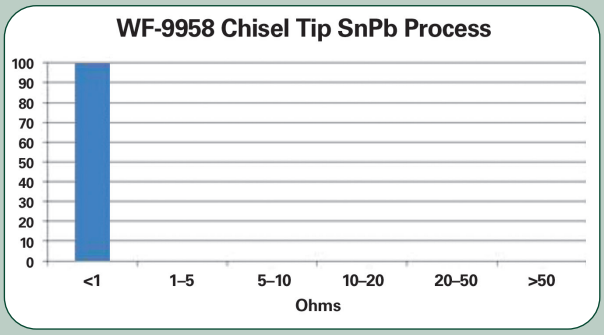
Soldering Performance*		
	Pb-Free	SnPb
100% PTH Fill Yield	97%+	99%+

**0.062" Indium Corporation test board 7 to 20mil diameter PTH*

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. This method measures the electrical resistance encountered by the test probe as a result of the presence of flux residue.





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)				
750–1,500	85–120	85–125	50–75	Pb-Free	3–5	265–270
500–1,000	60–110	60–120	50–75	SnPb	1.5–3.0	245–260

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-004B 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.

Contact our engineers: askus@indium.com

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Indium Corporation Compatible Products

- **Solder Paste**: Indium8.9HF
- **Cored Wire**: CW-807
- **Flux Pen**: FP-500 (rosin-containing)
  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-9958** Wave Solder Flux is not only compatible with Indium8.9HF Solder Paste, but also with our 5.8LS, 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. Please contact Indium Corporation Technical Support if you are interested in knowing about these fully-tested combinations.

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

*J-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.

This product data sheet is provided for general information only. It is not intended, and shall not be construed, to warrant or guarantee the performance of the products described which are sold subject exclusively to written warranties and limitations thereon included in product packaging and invoices. All Indium Corporation's products and solutions are designed to be commercially available unless specifically stated otherwise.

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.

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