PRODUCT DATA SHEET

# Indium8.9HFRV

## High-Reliability Solder Paste

## Introduction

**Indium8.9HFRV** is an air reflow, no-clean solder formulated to accommodate the higher processing temperatures required by SnAgCu, SnAgCuSb, and other alloy systems favored by the electronics industry to replace conventional Pb-bearing solders. **Indium8.9HFRV** features exceptional low-voiding performance. In addition, **Indium8.9HFRV** provides excellent stencil print transfer efficiency and response-to-pause performance.

## Features

- Formulated for low voiding when used with high-reliability alloys
- Halogen-free
- High transfer efficiency through small apertures (≤0.66AR)
- Excellent wetting
- Excellent response-to-pause performance
- Compatible with both Air and $N_2$ reflow environments

## Alloy

Indium Corporation manufactures low-oxide spherical powder composed of a variety of Pb-free alloys that cover a broad range of melting temperatures. This document covers Type 4 powder as a standard offering for high-reliability alloys. The metal percent is the weight percent of the solder powder in the solder paste and is dependent upon the powder type and application.

## Standard Product Specifications

| Alloy | Composition | Printing Metal Load |
|---|---|---|
| Indalloy®292 | Type 4 | 89.0% |
| Indalloy®276 | | |
| Indalloy®133 | | |
| Indalloy®259 | | |

## Storage and Handling Procedures

Refrigerated storage will prolong the shelf life of solder paste. Solder paste packaged in cartridges should be stored tip down.

| Storage Conditions (unopened containers) | Shelf Life |
|---|---|
| <10°C | 6 months |

Solder paste should be allowed to reach ambient working temperature prior to use. Generally, paste should be removed from refrigeration at least 2 hours before use. Actual time to reach thermal equilibrium will vary with container size. Paste temperature should be verified before use. Jars and cartridges should be labeled with date and time of opening.

## Packaging

**Indium8.9HFRV** solder paste is currently available in 500g jars and 600g cartridges. Alternate packaging options may be available upon request.

## Complementary Products

- **Rework Flux**: TACFlux® 089HFRV, TACFlux® 020B-RC

*Note: Other products may be applicable. Please consult one of Indium Corporation's Technical Support Engineers.*

## Industry Standard Test Results and Classification

| Test | Result |
|---|---|
| **IPC J-Standard-004** | |
| Flux Type Classification | ROL0 |
| Quantitative Halide Content | 0% |
| SIR (Ohms) | Pass |

| Test | Result |
|---|---|
| **IPC J-Standard-005** | |
| Typical Solder Paste Viscosity for Pb-free T4 | 1,340kcps |
| Tackiness | 20g |
| Slump Test | Pass |
| Wetting | Pass |
| Solder Ball | Pass |

*All information is for reference only.*
*Not to be used as incoming product specifications.*

**From One Engineer To Another®**

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## Printing

### Stencil Design:

Electroformed and laser cut/electropolished stencils produce the best printing characteristics among stencil types. Stencil aperture design is a crucial step in optimizing the print process. The following are a few general recommendations:

- Discrete components—A 10–20% reduction of stencil aperture has significantly reduced or eliminated the occurrence of mid-chip solder beads. The "home plate" design is a common method for achieving this reduction.
- Fine-pitch components—A surface area reduction is recommended for apertures of 20mil pitch and finer. This reduction will help minimize solder balling and bridging that can lead to electrical shorts. The amount of reduction necessary is process-dependent (5–15% is common).
- For optimum transfer efficiency and release of the solder paste from the stencil apertures, industry standard aperture and aspect ratios should be adhered to.

## Recommended Printer Operation

| | |
|---|---|
| Solder Paste Bead Size | ~20–25mm in diameter |
| Print Speed | 25–150mm/second |
| Squeegee Pressure | 0.018–0.027kg/mm of blade length |
| Underside Stencil Wipe | Start at once per every 5 prints and decrease frequency until optimum value is reached |
| Squeegee Type/Angle | Metal with appropriate length; 45 or 60° squeegees are typically used |
| Separation Speed | 5–20mm/second or per equipment manufacturer's specifications |
| Solder Paste Stencil Life | >8 hours (at 30–60% RH and 22–28°C) |

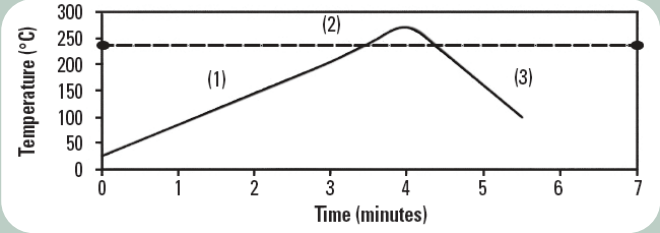
## Cleaning

**Indium8.9HFRV** is designed for no-clean applications; however, the flux can be removed, if necessary, by using a commercially available flux residue remover.

**Stencil cleaning** is best performed using isopropyl alcohol (IPA) as a solvent. Most commercially available non-water-based stencil cleaners work well.

## Reflow

### Recommended Profile:




### Heating Stage:

(1) A linear ramp rate allows gradual evaporation of volatiles and prevents defects such as solder balling/beading and bridging as a result of hot slump. It also prevents unnecessary depletion of fluxing capacity when using higher temperature alloys.

### Liquidus Stage:

(2) A peak temperature well above the liquidus of the solder alloy is needed to form a quality solder joint and achieve acceptable wetting due to the formation of an intermetallic layer. If the peak temperature is excessive, or the time above liquidus is excessive, flux charring, excessive intermetallic formation, and damage to the board and components can occur.

### Cooling Stage:

(3) This stage refers to the temperature range from the peak temperature to approximately 50°C below the liquidus temperature where the cooling rate has negligible effect. A rapid cool down is desired to form a fine-grain structure. Slow cooling will form a large-grain structure, which typically exhibit poor fatigue resistance.

| Reflow Profile Details | Recommended Parameters | Acceptable Parameters | Comments |
|---|---|---|---|
| Ramp Profile (Average Ambient to Peak)—Not the Same as Maximum Rising Slope | 1.0–1.5°C/second | 0.5–2.5°C/second | To minimize solder balling, beading, hot slump |
| Soak Zone Profile (Optional) | 20–60 seconds | 30–120 seconds | May minimize BGA/CSP voiding<br>Eliminating/reducing the soak zone may help to reduce HIP and graping |
| | 140–160°C | 140–170°C | |
| Time Above Liquidus (TAL)<br>Total Time and Temperature | 45–60 seconds | 30–100 seconds | Needed for good wetting/reliable solder joint |
| | Liquidus +20–30°C | Liquidus +15–40°C | |
| Cooling Rate | 2–6°C/second | 0.5–6.0°C/second | Rapid cooling promotes fine-grain structure |
| Peak Temperature in Air | 260°C | | As measured with thermocouple |
| Reflow Atmosphere | $N_2$ preferred for small components | | |

*Note: All parameters are for reference only. Modifications may be required to fit process and design.*



*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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