

## APPLICATION NOTE

# Solder Paste Storage and Handling Guidelines



### Solder Paste in Transit

Indium Corporation's published **Solder Paste Storage and Handling Conditions** on the product data sheets *are long-term material storage recommendations and not a shipping or temperature-at-receipt requirement.*

Indium Corporation designed and implemented a packaging system to protect solder paste from thermal damage while in transit. Most solder paste is shipped via next-day or 2-day delivery service. Our packing system is designed to maintain solder paste in a cool condition ( $\leq 35^{\circ}\text{C}$ ) for a minimum of 3 days.

Indium Corporation's solder paste can be held at temperatures up to  $35^{\circ}\text{C}$  for 7 days in transit without adverse effects on the solder paste performance. Solder paste in deliveries as received should be  $\leq 35^{\circ}\text{C}$ . If solder paste is received at temperatures exceeding  $35^{\circ}\text{C}$ , please contact your Indium Corporation representative to arrange for fitness-for-use testing.

### Solder Paste Storage

- Indium Corporation solder paste is refrigerated or frozen after manufacturing and shipped cold, often with a cold pack. This helps keep the solder paste from getting hot during shipping.
- Refrigerated storage prolongs the shelf life of solder paste;  $-20^{\circ}\text{C}$ – $-10^{\circ}\text{C}$  is common, although some solder pastes should not be frozen. Consult the product data sheet for specific information.
- Solder paste packaged in syringes and cartridges must be stored with the tip pointed down for best dispensing performance.
- For product-specific storage requirements and shelf life information, please refer to the product data sheet.
- When stored properly in refrigeration, solder pastes are often viable after the "use by" date. It is up to the user to validate use of paste after this recommendation.

### Storage Best Practices

- Solder paste is a shelf-life-dependent item and should be stored as such (in a First In-First Out manner).
- Upon delivery, solder paste packages should be directly put into a storage refrigerator ( $< 10^{\circ}\text{C}$ ).
- Solder paste should be removed from coolers and refrigerated for long-term storage.
- The manufacturing date is included on each label along with a "use by" date for best performance.
- Solder paste should be stored by lot, ensuring use of the older lots first for optimal material management.

### Environmental Impact on Processing

- Working life of solder paste is dependent on:
  - Temperature and relative humidity in the manufacturing environment (less than  $30^{\circ}\text{C}$ )
  - Sealed container, closed container, or open container
  - Air flow inside the stencil printer
  - Time of exposure on the stencil

### Excessive Heat Exposure

- Generally, solder paste is stable at temperatures less than  $25^{\circ}\text{C}$ .
- Solder paste exposed to temperatures  $> 30^{\circ}\text{C}$  for extended periods of time may no longer perform as expected.
- Key reasons for concern:
  - Significant flux separation
  - Potential for chemical decomposition, reducing the tack and activity of flux
  - Elevated viscosity, resulting in poor print transfer
- Contact Indium Corporation to discuss disposition on heat-damaged solder paste.

### Low-Temperature Conditions

- Generally, solder paste has preferred printing properties when above  $20^{\circ}\text{C}$ .
- Solder paste printed under conditions  $\leq 19^{\circ}\text{C}$  may not perform as expected.
- Key process risks:
  - Clogging, inconsistent print volume, and peaking caused by poor stencil release
  - Solder bead skids, does not roll when moving across stencil
  - Paste sticks to the blade, causing squeegee hang-up

### Before Using Solder Paste

- Prior to use, solder paste must equilibrate to the environmental conditions in which it will be used.
- It is important to remove sealed containers from refrigeration and equilibrate to room temperature before opening (typically at least 2 hours, up to 4 for large or frozen containers).
- Note: Opening cold solder paste in a warmer environment can result in condensation and potential performance impact.
- Recommendation: Remove a jar or cartridge of solder paste from refrigeration 1 day before use to allow plenty of time for equilibration in the environment (not recommended for syringes).
- Do not expose solder paste to heat ( $> 25^{\circ}\text{C}$ ) to bring it up to temperature.
- For quickest equilibration, a temperature-controlled water bath  $\leq 25^{\circ}\text{C}$  can be used.
- Label containers with date of removal from refrigeration to monitor exposure.

### Paste Handling Best Practices During Stencil Printing

- Hand stirring with a plastic spatula is the best method for re-homogenizing solder paste in jars. Hand-stirring should not be vigorous or extensive. It is not necessary to manually re-homogenize solder paste stored in cartridges or syringes.
- Use of mechanical/planetary mixing equipment is not necessary for homogenizing Indium Corporation's solder pastes. Planetary mixers should not be used to speed the process of bringing the solder paste to room temperature from cold storage.

From One Engineer To Another®



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### Aperture Ratio Chart

| Aperture Size (µm)       |   | 50   | 100  | 150  | 160  | 170  | 180  | 190  | 200  | 250  | 300   | 350   | 400   |
|--------------------------|---|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| Aperture Size (mils)     |   | 1.97 | 3.94 | 5.91 | 6.30 | 6.69 | 7.09 | 7.48 | 7.87 | 9.84 | 11.81 | 13.78 | 15.75 |
| Stencil Thickness (mils) | 5 | 0.10 | 0.20 | 0.30 | 0.31 | 0.33 | 0.35 | 0.37 | 0.39 | 0.49 | 0.59  | 0.69  | 0.79  |
|                          | 4 | 0.12 | 0.25 | 0.37 | 0.39 | 0.42 | 0.44 | 0.47 | 0.49 | 0.62 | 0.74  | 0.86  | 0.98  |
|                          | 3 | 0.16 | 0.33 | 0.49 | 0.52 | 0.56 | 0.59 | 0.62 | 0.66 | 0.82 | 0.98  | 1.15  | 1.31  |

Not typically within process window

Attainable with newer generation products

Typically within process window

- When solder paste is removed from the stencil, always store in a separate jar; re-introduction into fresh paste can result in process inconsistency.
- It is not necessary to return solder paste to the refrigerator after opening. It is possible that refrigeration can cause condensation and compromise performance (unless use environment is uncontrolled or >30°C).

### Stencil Printing Best Practices

- Board support, typically provided by vacuum tooling, is of paramount importance for consistent stencil printing.
- Use enough paste so that a generous bead is able to roll freely when the squeegee moves freely (typically 1/3" to 3/4" in diameter).
- Set squeegee pressure just high enough to ensure a clean swipe of the squeegee with no paste left on the stencil after the pass (for Indium Corporation pastes, typically 5kg is sufficient for a 10" blade).
- Solder paste is a thixotropic material, meaning it thins under pressure, so it only reaches optimal performance after a couple of prints (number varies depending on paste).
- Proper gasketing is very important, meaning alignment of apertures with pads, levelness of board surface, and solder mask definition should not detract from contact between the surface of the board and the stencil.
- To check for proper gasketing, check the alignment of stencil and board. While in contact, tap the stencil to ensure there is no space for deflection.
- Wiping the underside of the stencil intermittently to remove any excess paste is often necessary. Typically, a dry wipe with advancing paper and a vac cycle is sufficient.
- Refer to the product data sheet for specific wipe frequency recommendations. Frequency is also highly dependent on proper gasketing and process optimization.
- Calculating area ratios and staying within typical stencil guidelines will give best first pass yields (refer to the table above for guidelines).

- Powder size choice can also affect stencil printing (refer to *Powder Choice* application note for more information).
- Typically, higher transfer efficiencies correlate to higher area ratios.

### Best Practices for Syringe Dispensing Solder Paste

- Powder size selection is most important in choosing a solder paste to dispense.
- To determine powder size, use the chart below for guidelines depending on needle size.
- For indium-containing alloys, powder sizes may be limited.
- Viscosity is very important for consistent, smooth dispensing, and is dependent on metal loading (weight percent of solder powder in the paste). Please refer to the data sheet for optimal metal loading for dispense applications.

| Dispensing Needle |                |             |              | Largest Powder Size |
|-------------------|----------------|-------------|--------------|---------------------|
| Gauge             | EFD Color Code | ID (inches) | ID (microns) | Type                |
| 14                | Olive          | 0.060       | 1,520        | 2                   |
| 15                | Amber          | 0.053       | 1,350        | 2                   |
| 16                | Grey           | 0.047       | 1,190        | 2                   |
| 18                | Green          | 0.033       | 840          | 2                   |
| 20                | Pink           | 0.023       | 580          | 3                   |
| 21                | Purple         | 0.020       | 510          | 3                   |
| 22                | Blue           | 0.016       | 410          | 3                   |
| 23                | Orange         | 0.013       | 330          | 3                   |
| 25                | Red            | 0.010       | 250          | 4                   |
| 27                | Clear          | 0.008       | 200          | 5                   |
| 30                | Lavender       | 0.006       | 150          | 6                   |

Contact Indium Corporation's Technical Support Engineers at [askus@indium.com](mailto:askus@indium.com) to discuss alloy, particle size, and metal loading to best suit your application. This application note is for reference only. Please refer to product data sheets for shelf life requirements.

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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