Kester Solder Paste Storage & Handling Guidelines

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1. Shipping and Storage Information

1.1 Shipment and Storage Temperature Recommendations

Kester Solder always ships solderpaste accompanied by icepacks and/or dry ice to insure that the paste remains cool during the shipping process. All shipments of solderpaste are sent overnight to keep the paste cool until it reaches the customer's shipping dock. When solderpaste is received at the customer's location, the temperature should be in the range of 0 - 25 °C (32 - 77 °F). It is recommended that the solderpaste be stored in a refrigerator within the range of 0 - 10 °C (32 - 50 °F).

Why do we recommend refrigerated storage?

Refrigeration is recommended because cooler temperatures will slow the reactions that occur within the solderpaste. (As with most chemical reactions, the reaction rate is greatly increased with increasing temperature.) The reactions that take place inside the container will affect the paste's stencil life, printability and activity. Cool storage conditions simply slow the rate of these reactions, minimizing the change in solderpaste during storage.

What happens if the paste gets too cold?

At temperatures below -15 °C (5 °F), one or more components of the solderpaste may crystallize, producing a non-homogeneous appearance to the solderpaste. Such non-homogeneity may be irreversible, meaning that the paste would be unusable.

What happens if the paste gets too hot?

At temperatures above 38 °C (100 °F), the flux portion of the solderpaste may separate from the solder powder, producing a non-homogeneous appearance in the solderpaste. The top surface of the paste will appear "wet" and could have a yellow color to it. This type of non-homogeneity can usually be fixed by gently mixing the solderpaste with a spatula.

How should cartridges and syringes be stored?

Solderpaste cartridges and syringes are recommended to be stored upright and with the tip pointing downward. This will minimize the separation of the flux from the solder powder throughout the shelf life of the paste.
1.2 Shelf Life of Solderpaste

As mentioned above, solderpastes are reactive mixtures. The reactions that take place inside the container will impact the paste's consistency and performance with respect to time. The refrigerated storage minimizes these effects of the reactions. Specifically, Kester's Easy Profile 256 solderpaste has a 6 month shelf life at refrigerated temperatures (0-10 °C) and a 3 month shelf life at room temperature.

What reactions occur within a sealed solderpaste jar?

The combination of a reactive metal (in this case, tin) and an acid will slowly react to form metal salts. In the specific case of solderpaste, the various acids present in fluxes (abeitic acid, succinic acid, etc.) can react with tin to produce the corresponding metal salt (tin abeitate, tin succinate, etc.). Each time this reaction occurs, a tin atom is etched off the powder particle and is added to the flux portion of the solderpaste. This effectively thickens the solderpaste over time, resulting in a paste viscosity that can become too high for successful stencil printing. Additionally, since the acids are slowly reacting away before the paste's actual use, an older container of solderpaste can be expected to have less activity than a fresh jar would. Therefore, a container of solderpaste that has reached the end of its shelf life can be expected to demonstrate ill effects related to solderpaste printing and wetting.

It also should be noted that these reactions occur at all times and at all storage temperatures. Cold temperatures will extend shelf life, but will not produce an indefinite shelf life.

How long will solderpaste last after it has warmed to room temperature?

There is no straightforward answer to this, simply because it depends on the extent to which the reactions mentioned above have taken place. If, for example, a 2-week old jar of paste is brought out of the refrigerator, it should still be very "fresh" and it will still have the majority of its room temperature shelf life remaining. Older containers will be less "fresh" and will have less room temperature shelf life. In any event, paste can typically be stored at room temperature for a week or more before its use.

1.3 Bringing Solderpaste from a Storage Condition to a Usable Condition

Solderpaste should reach a stable room temperature before being put into use in a stenciling or dispensing operation. This can normally be achieved by taking the container of paste out of the refrigerator at least 4 hours prior to use. Optimal temperature for printing solderpaste is between 21 - 25 °C (70 - 77 °F).
How should solderpaste be mixed before use?

For many solderpaste formulations, mixing is not necessarily required before use. (Kester's Easy Profile 256 is an example of a paste that doesn't require mixing.) For those pastes that do require mixing, it is recommended to mix the paste gently for 1 minute or less. The purpose of the mixing should be to verify consistency, creaminess and homogeneity. Vigorous or excessive mixing can shear the solderpaste, which can ultimately produce bridging defects.

Is there a good way to warm paste other than placing at room temperature?

It is not recommended. Many paste users place cold jars of paste in a hot location (hot plate, top of the reflow oven, etc.) in an effort to accelerate the temperature change. This is a poor practice and it could cost the company in terms of wasted paste (due to separation) and rework.

2. Handling Information

2.1 Optimal Environmental Conditions during Use

Solderpaste will behave most consistently in the stenciling operation if the environment is controlled with respect to temperature and humidity. The optimal temperature is 21 - 25 °C (70 - 77 °F). The optimal humidity is 35 - 65% relative humidity. All Kester solderpastes are designed to perform within these ranges.

Why must temperature be controlled during the printing process?

The viscosity of solderpaste is highly dependent on its temperature. Paste viscosity will decrease as temperature increases. At temperatures above 25 °C, the paste may become runny and produce bridging or other defects. At temperatures below 21 °C, paste viscosity will increase, resulting in sluggish paste flow and insufficient solder joints.

Why must humidity be controlled during the printing process?

Humidity can greatly affect the stencil life of solderpaste. At low (<35% RH) humidity, solderpaste tends to dry out quickly, increasing viscosity over time. Increasing viscosity will reduce printability and will increase the presence of insufficient solder joints. At high (>65% RH) humidity, pastes can become hygroscopic (accept water). Water tends to produce unwanted reactions within solderpaste fluxes, often leading to defects including poor wetting and solderballing.
Should the printing environment be controlled by an "Environmental Control Unit" (ECU) within the stencil printer?

Generally, ECUs are not good for solderpaste. While they are effective at controlling the printer environment at consistent temperature and humidity, the airflow produced within the printer can dry the paste out very quickly. The method employed by ECUs is similar to an air conditioner for your stencil printer. The increased airflow will actually dry the paste out faster than if the ECU was not in use. The optimal way to control the printer environment is to keep the entire plant within the recommended environmental guidelines.

2.2 Variables that Affect Stencil Life

Several manufacturing and environmental conditions can affect the amount of usable time that solderpaste has. These factors include temperature, humidity, airflow in the printer, print frequency, squeegee pressure, line changeovers and amount of line downtime. Incorrect setup can severely reduce the stencil life of solderpaste.

If stencil life is so variable, what does the solderpaste data sheet mean when it describes the stencil life?

This figure (typically 8 to 12 hours) represents the maximum recommended stencil life, assuming all variables in the manufacturing setup and environment are ideal to maximize stencil life.

What can be done to maximize the stencil life?

The temperature and humidity recommendations are extremely important. Additionally, it is best to minimize the amount of airflow that the solderpaste sees, as this will dry out the paste. This can be done by eliminating the use of an ECU and keeping the stencil printer door closed as much as possible.

Many stencil life issues come from the paste drying out over time, which can happen if the paste is sitting idle too long. If the line is going to be down for more than one hour, it is best to place the solderpaste back into a closed container.
2.3 Reuse of Solderpaste

Trying to reuse solderpaste can often lead to problems. For that reason, most users take the approach that "it's just not worth it" to try reusing paste. After all, reusing paste is not worth the effort if it produces more rework costs than the paste’s value. With that said, these guidelines will give users the best chance of successfully reusing paste. It is best to place used paste into its own container, separate from fresh paste. Additionally, all used paste should be protected from further exposure from the elements. This means placing the original jar "insert" onto the paste and sealing the lid of the paste jar. It is not necessary to refrigerate the used paste, but it is best to attempt reuse as soon as possible. When attempting reuse, the printer operator should closely examine the paste's homogeneity, rolling behavior and brick definition on the first few prints. If the paste appears "normal" in these ways, it should also work successfully downstream. If the paste flow appears sluggish, or if the paste does not appear creamy or homogeneous, the paste ought to be discarded. In the cases where reuse is successful, it is best to replenish the stencil with some additional fresh paste as soon as possible.