

What's inside  
the machine?

**HumiSeal®**



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## RECOMMENDATIONS FOR THE REMOVAL & REWORK OF HUMISEAL UV CURE CONFORMAL COATINGS

### SCOPE

This application sheet outlines the techniques required for the removal of HumiSeal UV cure conformal coating.

The following versions of HumiSeal UV cure conformal coatings are covered in this document:

UV40, UV40-250  
UV50, UV50LV  
UV500, UV500LV

There are 3 methods for the removal of HumiSeal UV conformal coatings

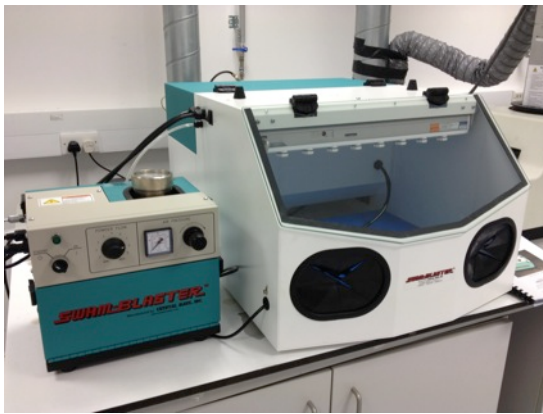
1. Mechanical removal: Powder Micro Abrasion
2. Thermal removal: Burn Through
3. Chemical removal

All three methods will effectively remove the coating, depending on the process requirements, to allow individual component replacement and subsequent re-coating.

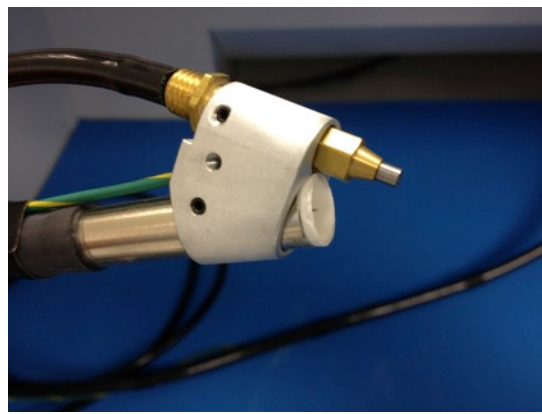
## REMOVAL OF ALL HUMISEAL UV CURE PRODUCTS

### 1- Mechanical Removal: (Powder Abrasion Method)

A powder abrasion system will safely and selectively remove HumiSeal UV cure conformal coatings from various components on printed circuit boards without causing any mechanical or ESD damage. The HumiSeal powder abrasion system is fully equipped with adjustable powder flow control and air pressure regulation to enable removal of the coating from pinpoint areas to larger areas. This method requires some relative dexterity as it uses high velocity particles delivered through a nozzle.



Powder Abrasion System



Nozzle and Point Ionization



Conformal Coating Removal

### **ESD (Electrostatic Discharge):**

A point ionizer effectively reduces the ESD from reaching levels that could potentially damage components during the removal process. A point ionizer introduces a flow of positive and negative ions into the abrasive path at the exit point of the nozzle tip. The rework chamber also contains several point ionizers and system meets NASA ESD requirements (report available upon request). Relative humidity can play a significant role in ESD generation. Additional ESD controls may be necessary when relative humidity drops below 30%.

**Powder media:**

There are several types of abrasive powders available for conformal coating removal including Carbo Blast, Plastic Blast and Soda Bicarbonate. Carbo Blast has been proven to be the least aggressive and successfully removes HumiSeal UV cure conformal coatings without affecting the solder resist or components. Made from wheat starch crystals it is the mildest of the available powders and does not cause any mechanical damage to the PCB. Carbo Blast is nontoxic and 100% water soluble.

Equipment parameters for removal of 100 microns dry film thickness:

Abrasive powder: Carbo Blast #25

Nozzle size: 0.8mm, Part No. 1529-32C

Air pressure: 120psi

Orifice plate: 0.040 X 8, Part No. 3462-9

*These settings are given as an indication only and as a starting point to perform removal of a fully cured film of UV40. Depending on the thickness, the age and the substrate quality, equipment settings may need to be slightly adjusted.*

**Recommendation:**

For best results when removing HumiSeal UV cure conformal coating, blast the coating for short periods with a high air assist. A longer exposure with a lower air assist may lead to damage of the solder resist and components.

**Cleaning After Removal by Powder Abrasion**

Although the powder abrasion system is fully equipped with an internal dust filtration system, it is important to guarantee that no residues are left on the board before recoating the reworked area.

**Procedure:**

- Remove excess powder with a compressed air jet.
- Immerse the PCB into a solution of DI water / Isopropyl Alcohol (IPA) at 1/1 dilution to rinse off any residues
- Rinse in a clean solution of IPA.
- Check under a black light that no coating residues are left on the reworked area
- Oven dry for 15 minutes at 60°C.

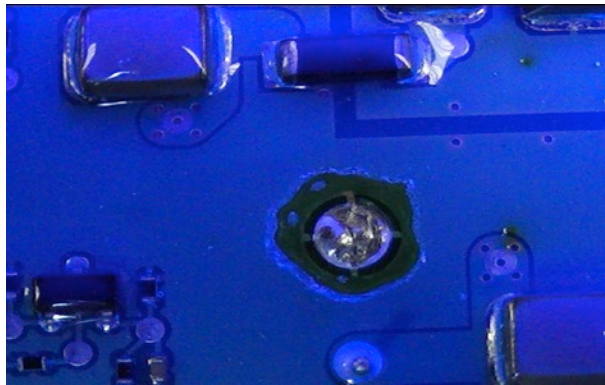
Note: The Carbo Blast powder is fully water soluble and the addition of IPA is to aid drying.

## **2- Thermal Removal (Burn Through Method):**

De-soldering techniques can be used to burn through or degrade a conformal coating. The temperature of the soldering iron decomposes the coating into a powdery solid that is easily removed from the substrate. This allows access to the underlying solder connections for component removal and replacement.

### **Procedure:**

The temperature of the soldering tip needs to be at least at 450C. Place the tip next to the areas that need to be reworked and touch the tip on the coating surface. As HumiSeal UV coatings have excellent high temperature stability, the high temperature of the tip will only melt the coating into white solid powder rather than actually burn it.

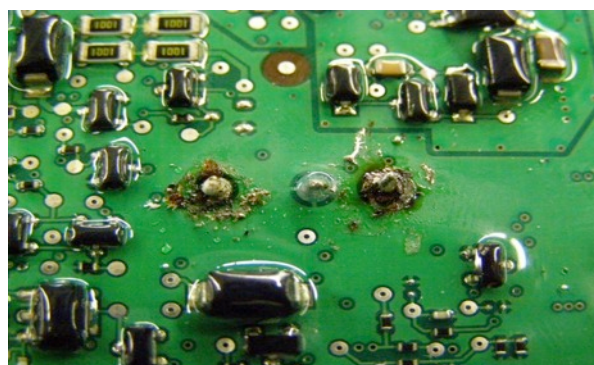


**Image #1 HumiSeal UV coating removed around a solder joint by thermal displacement**

Although fumes generated by HumiSeal UV coatings have been proven not to be harmful, adequate ventilation is recommended to dissipate any fumes generated during this process.

### **Recommendation:**

For best results when removing HumiSeal UV conformal coatings by thermal displacement, solder through the coating for a short period of time (<10sec.) with a high tip temperature. A good starting point is approximately 450C. If the coating does not burn in less than 10 seconds then increase the tip temperature by 20C. If the coating thickness is greater than 300 microns a longer exposure will be needed which could potentially lead to damaging the solder joint and the solder resist underneath (black residues). See image# 2. In order to avoid degrading the solder joint increase the tip temperature by 20C to reduce the exposure time.



**Image #2 UV coating removed around solder joints after excessive exposure with the solder tip.**

## **Health & Safety Considerations during thermal solder through a coating**

Various analysis were undertaken to determine the content of volatile components created during thermal rework of HumiSeal UV coatings. Based on gas chromatography / mass spectral analysis, the major constituents of the volatiles have been identified and quantified. These analytical results have been used to provide an estimate of volatile materials that would be generated for a given amount of coating reworked.

It is recommended to use a local exhaust ventilation to remove fumes and odor generated during the rework process of HumiSeal UV conformal coatings.

## **Cleaning After Thermal Removal**

In order to remove residues of coating after the thermal rework it is recommended to proceed as follows:

- Use a dry brush to wipe off the solid powder residues from the board
- Use a brush dampened with IPA to clean residues coming from the soldering process around the repaired area
- Check under a black light that no coating residues are left on the reworked area
- Oven dry for 15minutes at 60°C.

## **3- Chemical Removal Method**

HumiSeal UV conformal coatings can be removed using select strippers after UV cure, before the secondary moisture mechanism has completed. See Table 1 for the appropriate stripper selection.

HumiSeal UV40, UV50LV and UV40-250 can only be removed using Stripper 1100 once the coating has been UV and moisture cured.

HumiSeal UV50, UV500 and UV500LV can be removed with the correct HumiSeal chemical stripper. Recommended strippers are, HumiSeal 1080A, 1090 and 1100.

Please refer to Table 2 for the appropriate coating/stripper combination.

**Method:**

**1 – Local Area**

Using the selected stripper use a cotton bud or similar to apply the stripper to the area that requires removal. Wait until the stripper softens the coating and then use agitation with a small brush to dislodge the coating. Rinse the area that has been stripped with a 50/50 blend of deionized or distilled water and isopropyl alcohol (IPA) to remove the stripping chemistry. Oven dry for 15 minutes at 60°C.

Note: Sufficient extraction should be used during this process to remove chemical vapors.

**2 – Complete Removal**

To remove conformal coating from the entire circuit board it is necessary to submerge the assembly in the stripping chemistry. Increasing the temperature of the stripping chemistry will decrease the time required to soften or dissolve the coating. Increasing the temperature to approximately 40°C is recommended. Some agitation of the coating with a small brush may be required depending on the stripping chemistry selected, thickness and age of the coating will impact the length of time required to remove the coating.

Rinse the board that has been stripped with a 50/50 blend of deionized or distilled water and isopropyl alcohol (IPA) to remove the stripping chemistry. It is recommended to use a two stage rinse process with the first rinse removing the majority of the stripper and coating and the second rinse finishing the process, a clean final rinse. Oven dry the assembly for 15 minutes at 60°C.

Disposal of used stripping chemical should be carried out in accordance with local guidelines.

**HumiSeal Stripper and Coating Matrix – UV Cure Only**

Stripper	UV40	UV40-250	UV50 LV	UV500LV	UV50	UV500
1063	no	no	no	no	no	no
1080	no	no	no	no	no	No
1080A	yes	yes	yes	yes	yes	Yes
1072	softened	softened	softened	softened	softened	Softened
1090	no	no	yes	yes	yes	Yes
1100*	yes	yes	yes	yes	yes	yes

**Table 1:** HumiSeal Stripper matrix for coating removal post UV exposure and before moisture cure

\*Stripper 1100 not available in the EU

## HumiSeal Stripper and Coating Matrix – UV + Moisture Cure

Stripper	UV40	UV40 250	UV50 LV	UV500LV	UV50	UV500
1063	no	no	no	no	no	no
1080	no	no	no	no	no	No
1080A	no	no	no	yes	no	Yes
1072	no	no	no	softened	softened	no
1090	no	no	no	yes	yes	no
1100*	yes	yes	yes	yes	yes	yes

**Table 2:** HumiSeal Stripper/Coating Matrix after full cure (UV+moisture)

\*Stripper 1100 not available in the EU

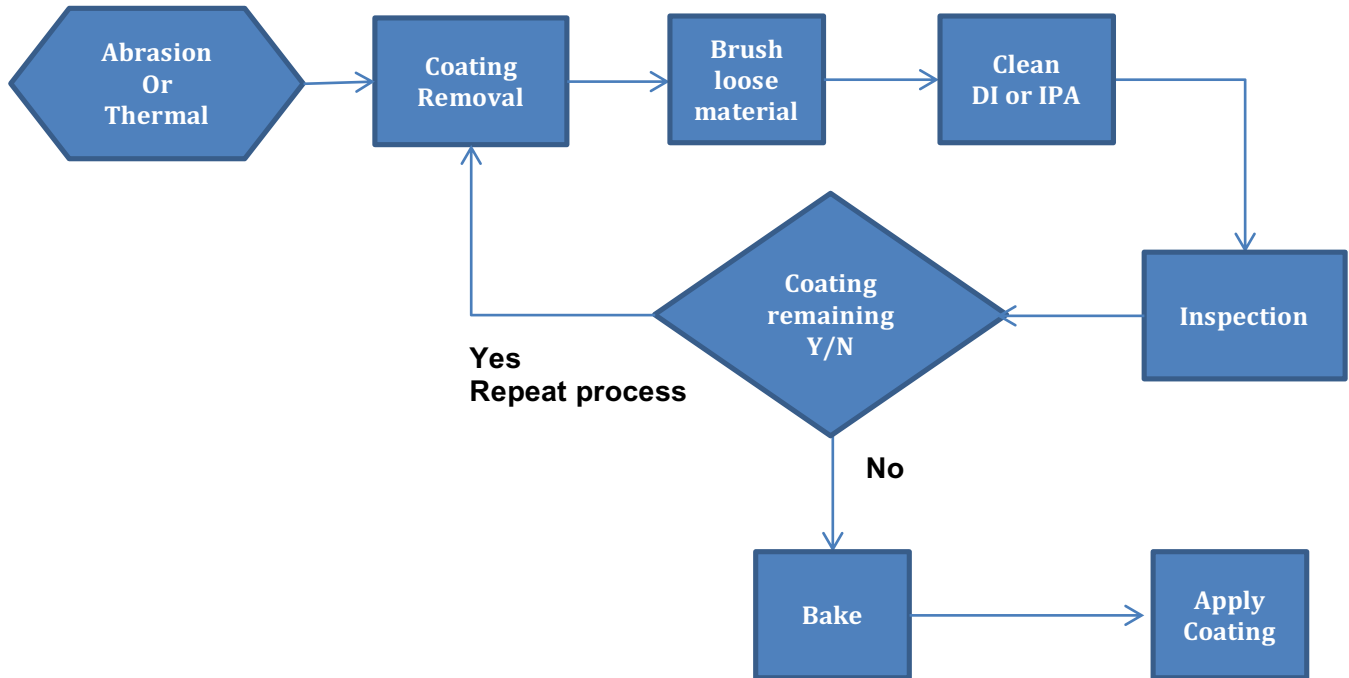
## 4 – Rework Recommendations

After local or complete stripping the circuit board will be repaired. Flux residues from reworked areas can contain potentially electrically conductive chemicals such as halogens or weak organic acids. It is recommended that the flux residue surrounding the reworked area is removed with a recommended cleaning chemistry and then rinsed and dried before recoating.

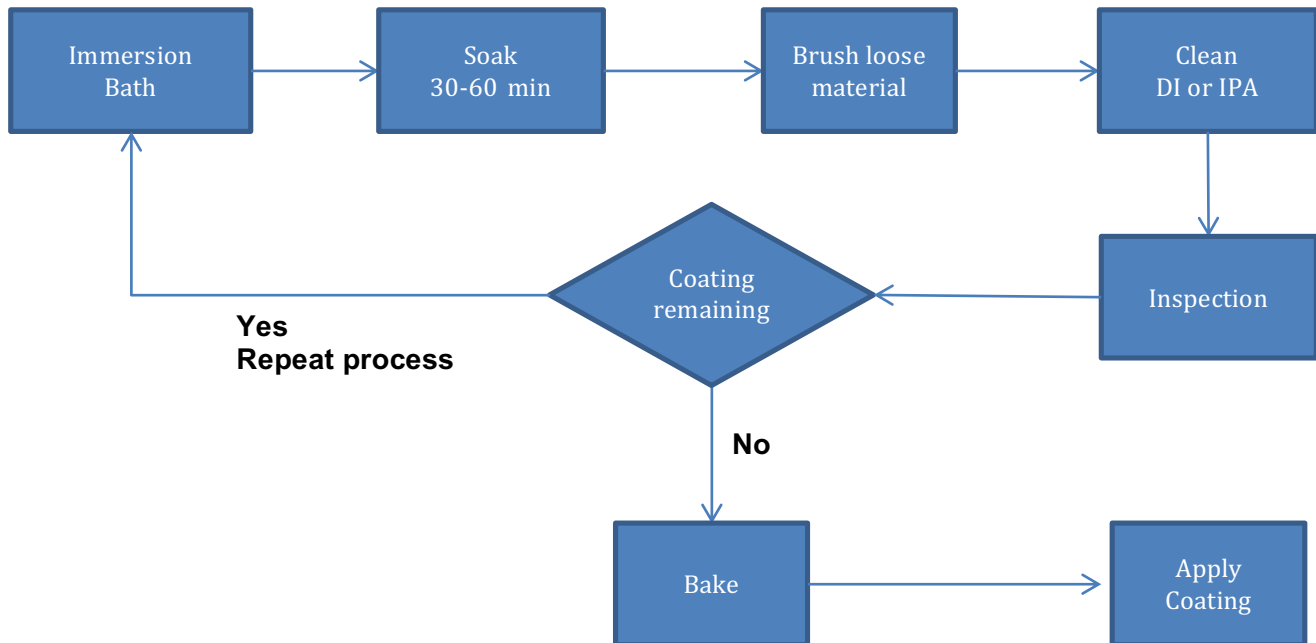
### Local Rework

It is recommended to use a solvent based polyurethane coating such as HumiSeal 1A20 or 1A33 to coat the repaired area. You should be sure the coating chosen for local repair is fully cured in accordance with the TDS and will meet the requirements to protect the board in its operating environment.

## REWORK OF CONFORMAL COATING – MECHANICAL – BASIC PROCESS



## REWORK OF CONFORMAL COATING – CHEMICAL – BASIC PROCESS



## **Reference Material**

IPC-HDBK-830A: Guidelines for Design, Selection and Application of Conformal Coatings

IPC-7711/7721: Rework, Modification and Repair of Electronic Assemblies

## **HumiSeal Technical Support**

If you are unsure of which process to use or are having difficulties please do not hesitate to contact our technical support staff:

Europe: [europetechsupport@humiseal.com](mailto:europetechsupport@humiseal.com)

USA: [techsupport@humiseal.com](mailto:techsupport@humiseal.com)

Asia: [asiatechsupport@humiseal.com](mailto:asiatechsupport@humiseal.com)