

## Conformal Coatings

Protecting the PCB board in critical applications which are exposed to harsh environmental working conditions is essential if product failure is to be avoided. A conformal coating is normally applied as a thin layer across the surface of the board, covering all components and delicate wiring.

For a coating to be effective it must have good adhesion to all the components and substrates, be unaffected by changes in operational temperature and be resistant to any contaminants, such as moisture and chemicals. Its ability to flow around, under and over the components without leaving areas exposed to the atmosphere especially on sharp edges, is also important.

All conformal coatings contain a UV indicator to enable easy visual quality control inspection under a UV light source.



### Coating Types

#### **VOC Free Silicone Coatings**

These 1-component silicone coatings are formulated using either Addition cure technology for heat cured coatings or Condensation cure technology for room temperature cure (RTV) using atmospheric moisture. CHT UK RTV coatings are very fast curing and the speed of cure can be further enhanced using elevated temperatures (40-60°C) together with high humidity.

Their ability to withstand a very wide operating temperature range makes them suitable for aerospace and automotive applications. Silicone also has a natural ability to protect against moisture ingress.

RTV coatings can be used for automated or manual application

#### **Key Features**

- ▶ Wide operating temperature range (-55 °C to + 200 °C)
- ▶ Room temperature or heat cure
- ▶ Low viscosity
- ▶ 100% solids (no harmful solvents)
- ▶ Excellent adhesion to many substrates
- ▶ Low odour
- ▶ RoHS compliant
- ▶ Not flammable
- ▶ Workable just after touch dry time without fire risk

## Acrylic

This solvented acrylic system is air drying and ideal to use where there may be a need to rework components on the PCB board after coating. It is possible to solder through this coating and easily remove it using a suitable cleaner, such as ACC50. It has approvals to MIL and IPC specifications.

### Key Features

- ▶ Meets requirements of MIL-I-46058C and IPC-CC- 830
- ▶ Removable with solvent cleaner for rework
- ▶ Temperature range -55 to +130 C
- ▶ RoHS compliant
- ▶ Can be soldered through without releasing toxic gas

## Application Methods

### Brushing

This is probably the simplest of the application methods and ideally suited to small scale production or prototypes.

For best results, coatings should be used at room temperature (above 16C), using a good quality brush. Apply the product gently to achieve a good coating without disturbing the wiring. The coating should then be left to dry in accordance with the curing regime stated on the technical data sheet.

### Spraying

Spraying is probably the most common form of application method which allows for accurate control of coating thickness. In order to use the coating through suitable spray equipment, it may be necessary to dilute the coating down to the desired viscosity. This viscosity will vary depending upon the coating and the equipment; technical data sheets provide approximate dilution rates only. It is important also to use only the recommended thinner as shown on the technical data sheet as this will vary from coating to coating.

These coatings can be used through manual air guns such as Devilbliss or airless equipment such as Nordson, PVA, Dima and Speedline. CHT technical staff are available to help with recommendations and trials to arrive at the best and most suitable coating for any combination of equipment and application.

After spraying the curing regime should be followed as detailed in the technical data sheet.

### Dipping

Dip coating is another simple method of application suitable for very small scale production. It involves total immersion of the PCB in the coating; this can be done by hand or for a more accurate coating, with a machine. The coating may be diluted with the specified thinners if required.

The PCB should be immersed vertically, if possible, and left for approximately 1 minute until air bubbles have dispersed. The PCB should be withdrawn very slowly so that an even film of the coating covers the surface of the PCB, it can then be allowed to drain and cure in accordance with the technical data sheet.

RTV cure materials are not recommended for dip cure in general, as this method would require a special treatment of atmosphere to avoid moisture to form a cured crust on the surface of the bath.

## Masking

To avoid coating parts of the board such as connectors a masking material such as ACC13, can be used. This synthetic mask is applied as a viscous liquid and will air dry or heat cure. After application of the coating it can be easily peeled off to leave a clean area free of coating. ACC13 brings a benefit of low-odour material without pungent ammonia odour, it is also much less corrosive than traditional liquid masking material.

**ACC13** is an air drying, pink liquid with a viscosity of 29,000 mPas which can be thinned with water. When curing it turns to translucent red colour for an easy inspection.

## Conformal Coating Range

The list below details the standard conformal coatings.

Product	ACC11	ACC15	ACC17	AS1740
Type	Acrylic	Silicone	Silicone	Silicone
Contains Solvents	Yes	No	No	No
Cure	Air Dry	RTV cure	RTV cure	RTV cure
Viscosity mPas	250-300	1180	400	40,000
Min Working Temp°C	-55	-55	-50	-62
Max Working Temp°C	+130	+200	+200	+200
Min Coating Thickness, microns	25	400	80	1000
Recommended Thinner	ACC31	ACC34	ACC34	N/A
Suitable for Brushing	Yes	Best	Yes	Yes
Mix Ratio for Brushing	1:1	1:1	1:4	-
Suitable for Spraying	Yes	Yes	Best	No
Mix Ratio for Spraying	1:1	1:1	1:4	-
Suitable for Dip Coating	Yes	No	No	No
Mix Ratio for Dip Coating	1:1	-	-	-
Key benefits	No toluene or xylene, UV trace	UV trace, no VOCs	UV trace, no VOCs	UV trace, no VOCs, excellent vibration and environmental protection
Typical Applications	Outdoor electronics	Outdoor LED units	General outdoor electronics, applied by machinery	Welding Equipment

## Testing results with Nordson Application Equipment

**ACC17** diluted to 80cps with ACC34UV to retain UV trace

Asymtek SC-280 Film Coater @ 80psi:

Layers of 300µm coating have been achieved at a speed of 600mm/s.

Above parameters are given as a general guideline for initial setup, adjustments may be needed to suit each specific application and process.