



# ConinsPune



GLOBAL QUALITY THROUGH  
INDIGENOUS TECHNOLOGY



**ISO 9001-2008 • C-DOT Approve • Mil-Standard Mil-I-46058C Type AR • RoHs Compliances**

## Conformal Coatings on PCB Assembly

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### GUIDELINES FOR CONINS PUNE PCB CONFORMAL COATING

#### What is conformal coating ?

Conformal Coating is a protective, dielectric coating designed to conform to the surface of an assembled printed circuit board. It is a chemical compound which forms a thin film like protective layer on the PCB when applied. It provides electrical insulation.

#### Why use conformal coating ?

The circuit and components need to be protected from extreme humidity. Conformal coating does this function. The moisture in the atmosphere settles down on the circuit and lowers the insulation resistance of the circuit. This affects the performance of the circuit and defective signal transmission and electrical leakage occurs.

Dust sticks to moist surface and the track resistance is reduced and shorts occur. Moisture also causes corrosion of the component-leads and the circuit-tracks, which is difficult to trace. The resultant decrease of dielectric strength affects the high frequency signals. Also, the conductive parts like chips get damaged. Dust settles down faster on the layer of moisture on the PCBs causing damage to the circuitry. In many applications, vibration damages the components in the circuit.

Other elements which affect the PCB are fungus growth, corrosion etc. Damage also occurs during construction, installation and use. Mechanical stress on components and thermal shock also matter much.

PCBs used in costal areas need effective protection because of the salty atmosphere prevailing there.

Conformal coating prevents damage arising out of the above factors. It forms a film covering the entire surface and the components thus preventing moisture coming in contact. It ensures protection from moisture, fungus, dust, corrosion etc. and reduces mechanical stress on components and thermal shock. Coating resists vibration, enhances performance and allows greater component density due to increased dielectric strength between conductors. Coating also enhances the life span of PCBs, gives a glossy, attractive, professional finish. It also prevents dust accumulation on the tracks or components.

#### Justification of additional cost input :

The additional cost input is negligible and the huge saving in service costs outweighs this cost. Conformal coating improves quality of PCBs and eliminates warranty failures. What is more, this coating enhances global acceptability to the PCBs. In advanced countries, conformal coating is invariably used in all fields, including entertainment electronics. Coating will give the extra edge to exporters' products.

#### Selection of Coating :

The environment in which the PCB is to be used and the characteristics of the Assembly to be coated are the two factors that will determine the selection. The properties that should be borne in mind are:

- a) **Electrical** : [Volume and surface resistivity, arc resistance, dielectric strength] The purpose of coating being provision of electrical insulation, the cured coating must have adequate dielectric strength and Insulating resistance.
- b) **Thermal** : [Temperature Endurance, thermal expansion, conductivity, flame resistance] The coating should have operating temp. range in consonance with the PCB assembly.
- c) **Humidity** : Coating should have low moisture permeability and low water absorption.
- d) **Mechanical** : [Resistance to cracking from thermal changes, abrasion, resistance] Good abrasion resistance is necessary to protect the PCB from Physical damages.
- e) **Chemical Resistance** : [Chemical and fungus resistance, hydrolytic stability] is an important factor when PCBs are exposed to industrial and coastal environments.

#### **Reparability :**

Reparability of PCBs is an important factor. Therefore, the coating selected should be solderable.

#### **Shelf Life :**

Shelf Life is the duration the coating can be kept in a closed container and also pot life, which is duration a coating can be used after being opened. Therefore, a coating which has longer shelf life should be preferred.

#### **Viscosity :**

Low viscosity coatings are important for high-density boards and high viscosity coatings are desirable for assemblies with sharp corners and projecting leads. Viscosity is finalized by trial and error method. Thinner can be used to adjust viscosity, provided coating is used in Lacquer form.

#### **U.V. Tracer :**

It is advantageous to select coatings with u.v. tracer. Coated boards placed under a UV lamp will clearly show the uncoated portions that could then be coated.

#### **Method of application :**

The volume of PCBs, processing time available, cost earmarked, safety and environmental impact will determine the method of application. If the number of boards to be coated is less, spraying from Aerosol cans is recommended. If they run into large volumes, spraying of lacquer by spray gun or appropriate machinery, or dipping is more economical.

#### **Spraying (Aerosol Cans):**

This is the most common and faster method. Aerosol can be sprayed directly on to the boards on both sides. Spray from a distance of 8 to 10 inches from the board uniformly. Spray each pass in one direction only from top to bottom. Shake the bottle well before each application.

An Earthing should be provided for the Aerosol Can to counter the Aerosol effect and the ESD voltage.

Lacquer can be sprayed with a spray gun and a compressor. Maintain uniform pressure and spray each passing the same direction from top to bottom of the board. If more thickness is required, inverse the board and spray in the same way once or twice again. Keep a distance of 8 to 10 inches from the board while spraying.

If there are sharp edges on one side of the board (on the solder side), place the board horizontally with component leads facing down after it is sprayed.

The spray gun should be held at a 45 angle. Ensure that all sides are sprayed properly.

#### **Dipping:**

Lacquer can be applied by dipping method. A clean tank should be used for dipping. After masking contact areas and test areas, the PCB should be slowly dipped fully in the lacquer and kept immersed in the lacquer for 5 minutes. Allow enough time for all air bubbles to escape. Remove the board from the lacquer slowly at a uniform rate of withdrawal.

### Brushing :

Where the number of assemblies is less, the lacquer can be applied by a thin brush. However, this method is not guaranteed to give best results.

### Precautions :

Use conformal coating in a very well ventilated area only. Do not use in an air-conditioned room.

A well-designed hood with a good exhaust system should be provided for spraying. The exhaust fan should have flame proof motor.

The area where conformal coating is sprayed should NOT have high humidity and dampness. A dehumidifier can be used, if necessary.

To get better results, you can provide necessary (500W) infrared lamps to keep the temperature in the spraying area at 35-40 C. This will prevent the moisture in the atmosphere affecting the coating when it is wet. The wet film will attract moisture in humid conditions and form smaller air bubbles on the surface and affect the gloss and finish of the film.

All precautions for a flammable material should be taken while using conformal coatings. Keep away from naked flame or flammable substances. The work area should not be near electrical switchboards or appliances.

These conditions are applicable to all lacquers.

Application of 2 coats will give better protection. The second coating should be done after about 10 minutes of the first coating.

### How to obtain optimum coating ?

The board should be clean and dry. Appropriate cleaning solution should be used to remove residues, grease, fluxes and fingerprints. Water and moisture may also accumulate on the boards. These elements affect adhesion and hence should be cleaned off. Moisture also affects the board. The board should therefore be dry. Cleaned boards are often baked (at 50C-60C) to make it dry. The Boards should always be kept in a clean, dust & damp-free place, before and after coating. Drying ovens, coating, masking and curing areas also should be dust-free, clean and dry.

### Covering & Masking :

The coating must cover the entire assembly. However, contact areas and test areas should be masked before coating.

### Quality & Storage :

High quality and uniformity of coating formulation are essential for consistent production and dependable performance.

Care should be taken while storing the coating material. Coatings should be stored in their original containers. They should be kept away from fire, flames and spark. Containers should always be kept closed so as to ensure that it is not spoilt and the shelf life unaffected.

### Types of conformal coatings:

**Acrylic (AR):** Generally the easiest coating to handle. Easy to apply, easy to remove and repair. The film dries fast in air. Easily solderable. Moisture resistance is comparable to urethane and silicon. Electrical properties are excellent. Pot life is long. Poor resistance to petroleum solvents. Good dielectric strength.

**Silicon (SR):** Good thermal shock resistance. Removal is difficult. Dielectric strength lower. Lower Abrasion Resistance.

**Urethane(UR):** Hard durable coating. Excellent abrasion resistance. Moisture resistance similar to acrylic. Very difficult to apply or remove. Repair is nearly impossible. Long curing time. Therefore, not generally preferred.

**Epoxies (ER):** Moisture resistance is excellent. Two-part system. Inconvenient to apply. Wastage during application. Very hard coating with good moisture and solvent resistance. Coating shrinks during curing and may stress the component. Virtually impossible to remove the film.

**TABLE 1 (Comparative Chart of Properties) :**

	AR	SR	UR	ER
Dielectric Strength	A	B	A	B
Surface Resistivity	A	B	A	B
Thermal Resistance	B	A	B	B
Thermal Conductivity	A	B	A	A
Resistance to Chemicals	B	B	A	A
Solvent Resistance	D	B	A	A
Abrasion Resistance	B	C	B	A
Humidity Resistance	A	A	A	B
Ease of Application	A	A	B	C
Ease of Removal	A	B	B	D
Pot Life	A	A	B	D
Curing Time	A	A	B	B

**A is best and D is worst**

### Role of CONINS

Conins Acrylcoat PCB conformal coating effectively addresses all the above problems and requirements. It has been developed, indigenously, keeping in view all the essential features required of a high quality Conformal Coating. Conins has made these essential features affordable for Indian consumers.

Acrylcoat is tested by C-DOT as per MIL Standard MIL-I-46058C which covers:

- Humidity Testing
- Thermal Endurance
- Transient Voltage Testing
- Thermal Shock test
- Insulation Resistance
- Dielectric withstand voltage test
- Salt spray test etc. under severe conditions.

Acrylcoat has withstood all the above tests and C-DOT has approved the product.

Reworking & repair is easy as the coating is SOLDERABLE. After soldering, a coat should be applied on the part.

Conins Pune Acrylcoat gives you the comfort of assured fail-proof quality.

### Conins Pune advantage :

“Conins Pune is capable of providing technical support for selection of proper coating and application methods depending upon customer's working environment. Conins' 25 years of industrial experience is a strong back up for users of its products.”