

Urethane Resin 101: Coating Fact Sheet



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Urethane Resin Process

Urethane Resins (Type UR) can be applied via: spray, dip, brush. The method of application will depend on the complexity of the masking involved, project volume, and costs of each method.

Spray application can be done via hand-spray, aerosol can, or by robotics. The material is usually diluted with solvents to get to a predetermined viscosity and is sprayed from all four quadrants at a 45 degree angle, when done manually or with aerosols. Robotic spray application is very useful whenever there is low board complexity, high volumes, and high repeatability. Unless these criteria are met, the cost of a skilled operator and programming time often outweigh the benefits of robotic spray.

Some advantages for spray coating are:

- High volume capable
- Reduced masking in comparison to the dip method
- Better tip and side edge coverage
- More uniform thickness
- Suitable for all conformal coatings

Dip coating is typically done by an automated machine, although it can be done manually as well. The assemblies are typically hung by an arm and then lowered in a dip tank containing the coating with an immersion rate determined by the population density of the PCB to be dipped and the desired thickness of the coating.

Some advantages to dip coating are:

- Coating penetration under components
- Coating thickness can be assured
- High volume capable
- Typical low process time

Brush coating is done manually by an operator with a brush. Brush coating is mainly employed during coating touchup operations or for conformal coating rework.

Some advantages to brush coating are:

- Cost effective for low volume projects
- Low startup cost

Main Benefits of Urethane Resin

- Ease of Use
- Excellent moisture barrier
- Quick drying
- No out-gassing



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- Hardness of coating

Common Applications of Urethane Resin

- Aircraft Electronics
- Space electronics
- LED assemblies
- Computer motherboards
- Power supplies
- Game cameras
- Other printed circuit boards

When to Use Urethane Conformal Coating

Urethane conformal coatings are an excellent choice to use for many conformal coating projects. Because of their resistance to chemical solvents, usefulness at mitigating tin whiskers, and overall hardness, they are a very popular conformal coating choice.

Chemical Resistivity

Urethane resin conformal coatings are very resistant to chemical solvents. They are second only to parylene conformal coating in their resistance. Applications that require any prolonged exposure to harsh chemical solvents should consider urethane resins.

Tin Whisker Mitigation

Long term NASA studies have shown that urethane conformal coatings are one of the few ways to successfully mitigate tin whisker growth. Since there is no known way to completely eliminate tin whisker growth, you have to select a proper tin whisker mitigation strategy. Urethane conformal coatings are a great place to start.

Hardness

For applications that can see any direct mechanical wear against the coating should consider urethane conformal coatings. Urethane resins are very hard and resistant to mechanical wear. Their hardness is second only to epoxy conformal coating, but urethanes are much easier to be reworked than an epoxy.

Type UR Conformal Coating Examples

There are many different varieties of type UR conformal coatings such as:

- HumiSeal 1A33
- HumiSeal 1A20

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- Humiseal 1A27
- Humiseal 2A64
- HumiSeal 1A34
- Hysol PC18M
- CONATHANE CE-1155-35
- CONAP CE-1170
- CONATHANE CE-1164
- Techspray Fine-L-Kote
- MG Chemicals 4223
- Electrolube PUC

You should consider using type UR conformal coating whenever your application has any issues with chemical resistivity as type UR coatings are very resistant to chemical solvents. Type UR conformal coating is also smart to include in any tin whisker mitigation strategy, as NASA studies have shown that urethane conformal coatings are one of the few ways to successfully mitigate tin whisker growth. Finally, applications that can see any direct mechanical wear against the coating should consider urethane conformal coatings as well.

Urethane Conformal Coating: When not to use

Urethane conformal coating is not suitable for all applications. Instances where the product is going into a high vibration environment or has a high heat requirement would not ideal candidates for urethane conformal coatings.

For products going into a high vibration environment, urethane conformal coatings are not a good choice. Because of the mechanical strength and resistance to abrasion characteristics that urethanes typically exhibit, a high vibration environment could ultimately end up weakening the integrity of this rigid coating. A better choice for a high vibration environment would be to go with a completely conforming, flexible coating, such as parylene conformal coating.

If an application is going to a high heat environment, urethanes will not provide the protection that is required. Leading urethanes, such as HumiSeal 1A33, offer protection to 125°C. Silicone conformal coatings, on the other hand, offer protection as high as 200°C. This is typical with conformal coatings, as silicones typically offer the best protection, temperature wise.

About Diamond-MT

Diamond MT was founded in 2001 as a firm specializing in contract applications of Conformal Coatings for Department of

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Defense and Commercial Electronic Systems.

Since our beginning, Diamond MT has established a reputation for providing the highest quality services in the industry. Our commitment to quality, integrity and customer satisfaction combined with an unmatched expertise in applications and processes has provided every one of our customers with superior results.

Diamond MT operates out of a free standing 12,000 square foot building in Johnstown, Pennsylvania which is located 60 miles southeast of Pittsburgh. Diamond MT is located near three major interstates and is supported by the Cambria County Airport which serves as a primary freight terminal for south central Pennsylvania.



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