

Photocurable Putties and Adhesive Routes for Additive Manufacturing

Measured bond and repair performance with substrate-, cure- and ageing-specific validation

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Highlights

- Adhesion is described by measured performance rather than assumed covalent bonding.
- Substrate preparation, bond-line thickness, cure and ageing are route-specific.
- Bio-based content does not establish food-, skin- or implant-contact certification.
- ESD-safe is retained only for documented ESD applications without certification implication.
- Final repaired or bonded articles require application-specific acceptance.

Abstract

Photocurable putties and adhesives support bonding, gap filling, repair and surface-finishing workflows when material pair, surface preparation, bond geometry and cure are controlled.

Chemical bonding mechanisms are not asserted without evidence. Bond strength, failure mode and durability are measured on the relevant substrates and environmental conditions.

Bio-based or ESD positioning remains separate from food-contact, biological or regulatory conformity of the final article.

Keywords photocurable adhesive · putty · repair · bond line · substrate · ageing

Source use. Product evidence is in [1]; adhesive methods in [2–4]; AM and ESD cross-control in [5–6].

1. Bond-system definition

The record identifies both substrates, surface preparation, adhesive/putty, bond-line thickness, fixture, exposure and post-cure.

- Define geometry and load mode.
- Measure failure mode.
- Control oxygen/shadowed regions.



Release requires traceable evidence at every gate; a catalogue label cannot bypass the chain.

Figure 1. WP-36 evidence gates from controlled material description to final acceptance.

2. Performance and ageing

Bond performance is measured after relevant temperature, humidity, chemicals, cycling and service exposure. Mechanism language is used only when analytically supported.

- Report method and uncertainty.
- Challenge worst-case surfaces.
- Define repair acceptance.

3. Application boundary

ESD-safe is an industry descriptor only where documented. Bio-based content and adhesion do not establish regulated-contact suitability.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Substrates	Identity, surface state and preparation	Catalogue description only until evidence is linked
Bond	Material, thickness, cure and fixture	Control process variables and change triggers
Testing	Strength, failure and ageing	Report method, result, uncertainty and limits
Article	Service, ESD and compliance requirements	Apply final acceptance and responsibility boundary



Description ≠ measured result ≠ certification or finished-device approval

Figure 2. WP-36 separates catalogue positioning, measured evidence and final application decisions.

KEY INSIGHT

Precise product or application language is retained only when the exact formulation, method, processed specimen and controlled evidence can be traced.

5. Limitations

- Covalent bonding is not assumed.
- Performance is substrate- and cure-specific.
- ESD-safe does not mean certified.
- Bio-based does not establish contact suitability.
- Final-article validation remains required.

6. Conclusions

- Adhesion is described by measured performance rather than assumed covalent bonding.
- Substrate preparation, bond-line thickness, cure and ageing are route-specific.
- Final repaired or bonded articles require application-specific acceptance.
- This corrected candidate remains local and on HOLD until series-wide scientific, metadata and visual release checks are complete.

Revision note

Version 5.3 replaces categorical covalent-bond claims with measured bond performance and retains explicit biological, contact and ESD evidence boundaries.

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Disclosure. Dr. Juan Segurola is founder and Scientific Director of 3Dresyns by Resyner Technologies S.L., the supplier of the materials discussed.

References

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- [3] ISO 11339:2022. Adhesives—T-peel test for flexible-to-flexible bonded assemblies.
- [4] ASTM D1002. Apparent shear strength of single-lap-joint adhesively bonded metal specimens.
- [5] ISO/ASTM 52900:2021. Additive manufacturing—Fundamentals and vocabulary.
- [6] 3Dresyns WP-27. Conductive Photopolymer Formulations, corrected candidate.