

PEEK-Like VPP Photopolymer: Engineering Performance and Application Boundaries

HV and LV processing variants with verified mechanical data and finished-device validation requirements

Dr. Juan Seguro, founder and Scientific Director · 3Dresyns by Resyner Technologies S.L. · General Etxague 15B, 20003 Donostia / San Sebastián, Gipuzkoa, Spain · info@3dresyns.com · www.3Dresyns.com

Highlights

- PEEK-like is a VPP engineering photopolymer; it is not polyether ether ketone.
- HV and LV are processing variants whose composition, cure behaviour and final properties require controlled comparison.
- Numerical properties are retained only with current TDS values, methods, specimen conditioning and report references.
- Biological documentation is described by test and tested condition rather than ISO 10993-compliant wording.
- Medical and dental uses are candidate areas requiring validation of the finished device and complete manufacturing process.

Abstract

3Dresyn PEEK-like is a VPP engineering photopolymer supplied in HV and LV processing variants. The term PEEK-like denotes selected reported engineering behaviour and does not imply that the cured photopolymer is PEEK or reproduces the full property envelope of thermoplastic PEEK.

Mechanical, thermal, physical and chemical-resistance claims must be tied to the exact variant, test method, specimen preparation, post-cure, conditioning and controlled report. HV and LV equivalence should be claimed only for properties demonstrated on both variants.

Where biological test information exists, the paper should identify the tested formulation, final processing condition, endpoint, extraction conditions, laboratory report and limitations. This information can support a finished-device biological evaluation but does not establish material-level ISO 10993 compliance, MDR classification or medical-device conformity.

Keywords PEEK-like · VPP photopolymer · HV · LV · engineering validation · ISO 10993 · finished device

Source use. Controlled variant documentation is mapped in [1]; photopolymer context in [2–3]; mechanical, thermal and chemical methods in [4–8]; biological, quality-system and legal boundaries in [9–11].

1. Meaning and limits of PEEK-like

PEEK-like is a commercial functional comparison. The cured material is a crosslinked photopolymer, not the thermoplastic polyether ether ketone. It must not inherit PEEK's chemistry, melting behaviour, continuous-use temperature, chemical resistance, fatigue, sterilization or long-term clinical history without direct evidence [1–4].

Selection should therefore begin with quantitative requirements and current variant-specific data. Conventional PEEK can serve as a design reference only when every relevant property and test condition is compared explicitly.

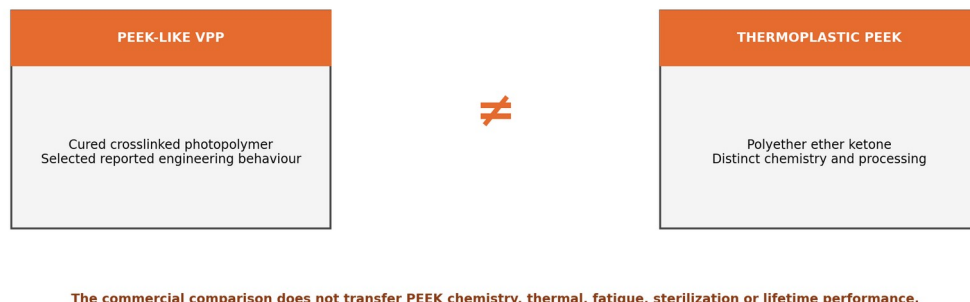


Figure 1. PEEK-like and thermoplastic PEEK are chemically and structurally distinct. The name is not an equivalence claim.

2. HV and LV variant control

Viscosity can affect recoating and platform compatibility, but it must not be assumed to be the sole difference between HV and LV. Composition, additives, cure response, homogeneity, final properties and chemical or biological documentation must be compared through controlled records.

COMPOSITION	Controlled formulation identity
PROCESS	Viscosity, cure and printer window
PROPERTIES	Mechanical, thermal, chemical and physical data
BIOLOGICAL DATA	Exact tested formulation and processed specimen

HV-LV equivalence is claimed only for each property demonstrated on both controlled variants.

Figure 2. Evidence needed before claiming equivalence between HV and LV. Each retained property requires support on both variants.

3. Numerical-data verification before publication

Property group	Minimum record for HV	Minimum record for LV	Retention rule
Mechanical	Method, specimen, post-cure, conditioning, result	Same controlled fields	Retain only variant-specific verified values
Thermal	Method, load, geometry and conditioning	Same controlled fields	HDT is not a universal service temperature
Chemical	Medium, concentration, time, temperature and measured change	Same controlled fields	No portfolio-wide resistance claim
Physical / process	Density, water uptake, viscosity method and temperature	Same controlled fields	Do not assume viscosity is sole difference
Biological	Exact formulation, processing, endpoint, extraction and report	Separate or justified equivalence evidence	Describe tests, not ISO compliance

The former manuscript's numerical property ranges remain withheld from this corrected candidate until a current TDS and controlled test-report reference is recorded for HV and LV separately. This applies to flexural and tensile properties, modulus, elongation, impact, hardness, HDT, density, water uptake, chemical resistance and viscosity.

KEY INSIGHT

Withholding an unverified number is preferable to publishing a precise value whose variant, method, conditioning or report cannot be traced.

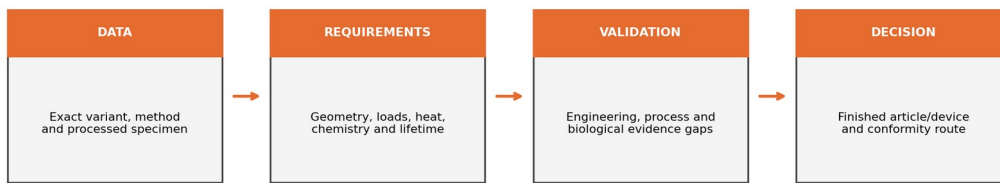
4. Printer and post-processing envelope

No material covers every SLA, DLP and LCD machine automatically. The controlled processing window identifies wavelength or spectrum, build-plane irradiance, exposure, layer thickness, vat temperature, recoating conditions, geometry, orientation, cleaning, drying and post-curing. The current product IFU/TDS and local calibration define the starting route.

Any change in variant, additive, printer, wavelength, thermal condition or post-processing can require reassessment. A successful print does not establish mechanical, chemical or biological suitability.

5. Engineering application validation

Candidate engineering uses are defined by service loads, temperature/time history, fluids, ageing, dimensional tolerance and failure modes. Relevant tests may include tensile, flexural, impact, HDT, creep, fatigue, thermal cycling, chemical exposure and part-level dimensional or functional verification. Acceptance criteria belong to the intended article.



Candidate uses are not authorized applications; the final requirements and evidence decide suitability.

Figure 3. Application gate from controlled variant data to finished-article or device decision.

6. Biological and regulatory boundaries

The PEEK-like material is supplied as a professional manufacturing material, not as a finished medical device. The legal manufacturer defines intended purpose and device classification, validates manufacturing and performs biological evaluation within risk management for the finished device.

Material test reports may support that evaluation when formulation, specimen preparation, post-processing and contact context are relevant. They must not be described as covering MDR Classes I, IIa or IIb and do not prescribe a fixed ISO 10993 test battery. ISO 13485 concerns quality-management systems; if cited, certificate holder, scope, issuing body and validity must be identified and it must not be used as proof of material performance or biological safety.

7. Minimum evidence record

- Exact HV or LV variant, batch where applicable, formulation status and controlled-document revision.
- Printer, spectrum, irradiance, exposure, vat temperature, layer, orientation and geometry.
- Cleaning, drying, post-curing, conditioning and sterilization where applicable.
- Method, specimen, sample count, uncertainty, result and acceptance criterion for every numerical claim.
- Separate biological test endpoint, processed specimen, extraction condition, laboratory report and limitation.
- Finished-article/device requirements, risk decisions, conformity route and legal-manufacturer ownership.

8. Limitations

- PEEK-like is not PEEK and does not inherit its complete performance envelope.
- HV and LV equivalence cannot be assumed from viscosity or a shared family name.
- Unverified numerical values are not retained in this corrected candidate.
- TDS values support screening and do not establish lifetime performance or application conformity.
- Biological test data are condition-specific and do not certify the resin or determine MDR class.
- Medical, dental, surgical and implant-adjacent uses require finished-device evidence and regulatory assessment.

9. Conclusions

- PEEK-like is a distinct VPP photopolymer with selected reported engineering behaviour, not thermoplastic PEEK.
- HV and LV require variant-specific controlled composition, process, property and biological evidence.
- Numerical claims remain blocked until current TDS and controlled report traceability is recorded.
- Processing and application suitability are established on the complete material–printer–process–article system.
- Finished-device biological evaluation and regulatory conformity remain with the legal manufacturer.

Revision note

Version 5.3 removes ISO 10993 verified and MF Bio compliance language, material-level MDR classes, the fixed biological battery, universal printer coverage, assumed HV/LV equivalence and inherited PEEK claims. Numerical values are withheld pending variant-specific TDS and report verification.

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

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- [10] ISO 13485:2016. Medical devices — Quality management systems — Requirements for regulatory purposes.
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