

Optical Selection System for VPP Photopolymer Development

Refractive-index screening, formulation tuning and printed-part verification at the design wavelength

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Highlights

- Refractive index is reported with wavelength, temperature, specimen state and method.
- Catalogue routes and additives support screening; the printed part is verified at the design wavelength.
- Blending and additive tuning can be non-linear and require cure, stability and optical-loss assessment.
- TDS values are not automatically certified values and do not establish optical-device conformity.
- Biological evaluation, MDR and IEC 60601 are application-specific and are not material certifications.

Abstract

The Optical Selection System organises candidate VPP formulations by refractive-index needs and provides formulation-development routes for low-, medium- and high-index work. Index values are meaningful only with wavelength, temperature, specimen state and measurement method.

Mixing adjacent routes or adding high-index concentrates can change cure, homogeneity, absorption, scattering, mechanics and ageing. Intermediate index must be measured on the exact printed and post-cured system rather than inferred from a simple volume rule.

Optical verification and any biological or medical-device conformity pathway are application-specific. Refractive index, a TDS, a customization contract or a product family does not establish certification of the final optical component or device.

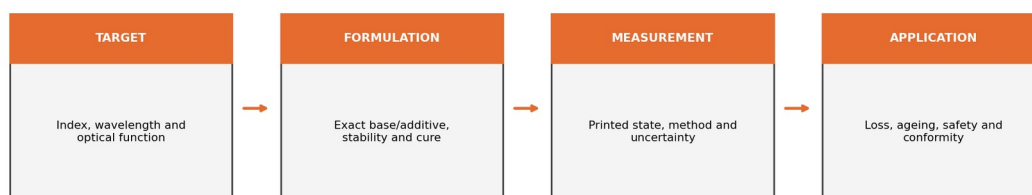
Keywords refractive index · VPP optics · OSS · index matching · wavelength · printed-part verification

Source use. Product optical evidence is controlled in [1]; refractive-index measurement in [2]; photopolymer background in [3–4]; biological and legal scope in [5–6].

1. Optical data record

Each value identifies formulation, specimen state, wavelength, temperature, method, calibration, post-cure and uncertainty. Dispersion, transmission, haze, absorption, scattering and ageing are added when they affect the intended optical function.

- Verify on a representative printed flat or part.
- Use current product-specific TDS and report identifiers.
- Separate qualitative route mapping from measured performance.



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

Figure 1. WP-19 evidence gates from controlled material description to final acceptance.

2. Formulation and blending control

Refractive-index tuning is not assumed linear. A formulation change triggers homogeneity, stability, cure-depth, lateral-cure, shrinkage, surface, optical-loss and mechanical checks.

- Record base and additive identities and dosage.
- Calibrate printer exposure after every change.
- Measure the final system at the use wavelength.

3. Conformity terminology

Biological evaluation, optical performance verification and medical-device conformity are application-specific. ISO 10993 is a biological-evaluation framework, Regulation (EU) 2017/745 governs medical devices, and IEC 60601 standards concern specified medical electrical equipment and systems. Refractive index establishes none of these outcomes.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Target	Index, wavelength and optical function	Catalogue description only until evidence is linked
Formulation	Exact base/additive, stability and cure	Control process variables and change triggers
Measurement	Printed state, method and uncertainty	Report method, result, uncertainty and limits
Application	Loss, ageing, safety and conformity	Apply final acceptance and responsibility boundary



Description ≠ measured result ≠ certification or finished-device approval

Figure 2. WP-19 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

- Index values cannot be transferred across wavelength, temperature or specimen state without evidence.
- Blending is not assumed linear.
- TDS values are screening data unless tied to a controlled measurement report.
- A customization service does not establish certification.
- Finished-device requirements remain application-specific.

6. Conclusions

- Refractive index is reported with wavelength, temperature, specimen state and method.
- Catalogue routes and additives support screening; the printed part is verified at the design wavelength.
- Biological evaluation, MDR and IEC 60601 are application-specific and are not material certifications.
- 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 generic certification language with application-specific evaluation and conformity terminology, adds complete refractive-index measurement conditions and removes automatic blending or TDS-certification implications.

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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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- [5] ISO 10993-1:2025. Biological evaluation of medical devices—Part 1.
- [6] Regulation (EU) 2017/745 on medical devices, current consolidated version.