

Data Integrity and FAIR Evidence for Photopolymer Qualification: Raw Data, Metadata, Audit Trails and Reuse

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ER-298 · Engineering Review · Version 0.3 · 23 September 2026

Abstract

Data Integrity and FAIR Evidence for Photopolymer Qualification is evaluated as the bounded decision of whether qualification evidence can be independently reconstructed, interpreted and reused without losing configuration, provenance or access controls. The controlled state comprises raw measurement, metadata, processing code/version, derived result, review/approval, correction, archive state, access condition and persistent identifier. For ER-298, the three cited sources are used only for the evidence roles stated below and only within their demonstrated scope. ER-298 defines measurements, transfer logic, failure modes and release gates specific to this subject; no universal process window, product recipe or compliance conclusion is inferred.

Keywords: data integrity; FAIR; raw data; metadata; audit trails; provenance; reuse; photopolymer qualification

1. Significance, scope and ownership

ER-298 owns whether qualification evidence can be independently reconstructed, interpreted and reused without losing configuration, provenance or access controls. The review is organised around the decision-specific evidence chain and leaves neighbouring ownership intact.

1.1. Corpus boundary

FAIR and data integrity govern the evidence object rather than the physical process itself. ER-291 retains the manufacturing thread, ER-292 requirement traceability, and ER-297 metrological validity. ER-298 owns raw data, metadata, provenance, transformations, audit trails, fixity and the conditions under which qualification evidence can be reused.

2. Subject-specific state model and causal chain

For ER-298, causal interpretation begins by freezing raw measurement, metadata, processing code/version, derived result, review/approval, correction, archive state, access condition and persistent identifier. A dataset can be findable yet unusable for qualification if its specimen identity, transformation history or decision context cannot be reconstructed.

3. Direct evidence and point-of-use source map

The GO FAIR Foundation describes FAIR as Findable, Accessible, Interoperable and Reusable, with rich metadata and provenance, while explicitly noting that FAIR is not the same as open and does not guarantee intrinsic data quality. ISO 9001:2026 and the ER digital-thread architecture provide governance context. ER-298 combines data integrity with FAIR reuse without treating one as a substitute for the other. Reference [1] is used for FAIR principles and explicit limits of FAIR. Reference [2] is used for quality-management records/governance context. Reference [3] is used for the controlled-candidate digital-thread architecture.

4. Measurement architecture

The measurement architecture for ER-298 is built around raw-to-result provenance, immutable/auditable changes, metadata completeness, persistent identifiers, machine-readable relationships, controlled access, checksum/fixity and reproducibility of derived outputs. Raw files, metadata, transformations, checksums and audit events are preserved as linked evidence so that a later reviewer can reproduce the interpretation without reconstructing undocumented steps.

5. Qualification and transfer

Data-governance controls transfer when identifiers, metadata semantics, transformation records and fixity mechanisms remain preserved through the new repository or software path. Format conversion without provenance checks is not a valid bridge.

6. Failure modes and interpretation traps

The central interpretation trap in ER-298 is that only final plots are retained; data are FAIRly indexed but scientifically wrong; open access is confused with FAIR; transformations cannot be reproduced from raw data. Raw data, metadata, provenance, transformation, audit trail and fixity gates prevent FAIR labels or repository presence from substituting for reconstructable evidence.

7. Non-compensatory release gates

Gate	Minimum evidence	Blocking failure
Raw data	Original observations retained	Only final plot
Metadata	Units/method/configuration complete	Context lost
Provenance	Raw-to-derived lineage explicit	Result detached from source
Transformation	Code/formula/version reproducible	Manual undocumented edits
Audit trail	Corrections preserved, not overwritten	History erased
Identifiers/fixity	Persistent ID/checksum or equivalent	Objects cannot be matched
Access	Authentication/rights described	Open confused with FAIR
Reuse interpretation	Domain context and limitations retained	FAIR indexing treated as scientific validity

8. Minimum verification experiment

Take one qualification result and reproduce it from archived raw data, controlled processing logic and metadata on a clean environment. Verify identifiers, hashes, units, configuration links, audit history and access conditions. Then test whether a second analyst can locate and correctly interpret the dataset without undocumented knowledge.

9. Knowledge boundary

FAIR improves findability/access/interoperability/reuse but is not equivalent to openness and does not guarantee intrinsic data quality or ethics. Reconstructability still depends on domain metadata, controlled transformations and preserved provenance.

10. Conclusions

ER-298 defines reusable qualification evidence as reconstructable data with preserved metadata, provenance, transformations and audit history; FAIR principles alone are not a quality verdict.

References

1. GO FAIR Foundation. The FAIR Guiding Principles. <https://www.gofair.foundation/fair-principles> (accessed 23 September 2026).
2. International Organization for Standardization. ISO 9001:2026 Quality management systems — Requirements. Geneva: ISO; 2026.
3. Juan Segurolo. Digital Thread for Photopolymer Manufacturing: Requirements, Geometry, Material, Process, Inspection and Release. ER-291. Controlled candidate; 2026.

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