



TECHNICAL BRIEF · VAPOR SMOOTHING FOR SLS

Formlabs Nylon 12 on the **DyeMansion VX1**

Specific applications carry specific surface requirements: sealing, cleanability, tightness, and, where it matters, hygiene. VaporFuse Surfacing is what unlocks them on Formlabs Nylon 12. Here's what it adds, measured. Surface. Mechanical properties. Dimensional accuracy.

-67 %

SURFACE ROUGHNESS (Sa)

average, 3 geometries

+96 %

IMPACT STRENGTH

Charpy, unnotched

≤ 0.3 %

DIMENSIONAL CHANGE

from the smoothing step

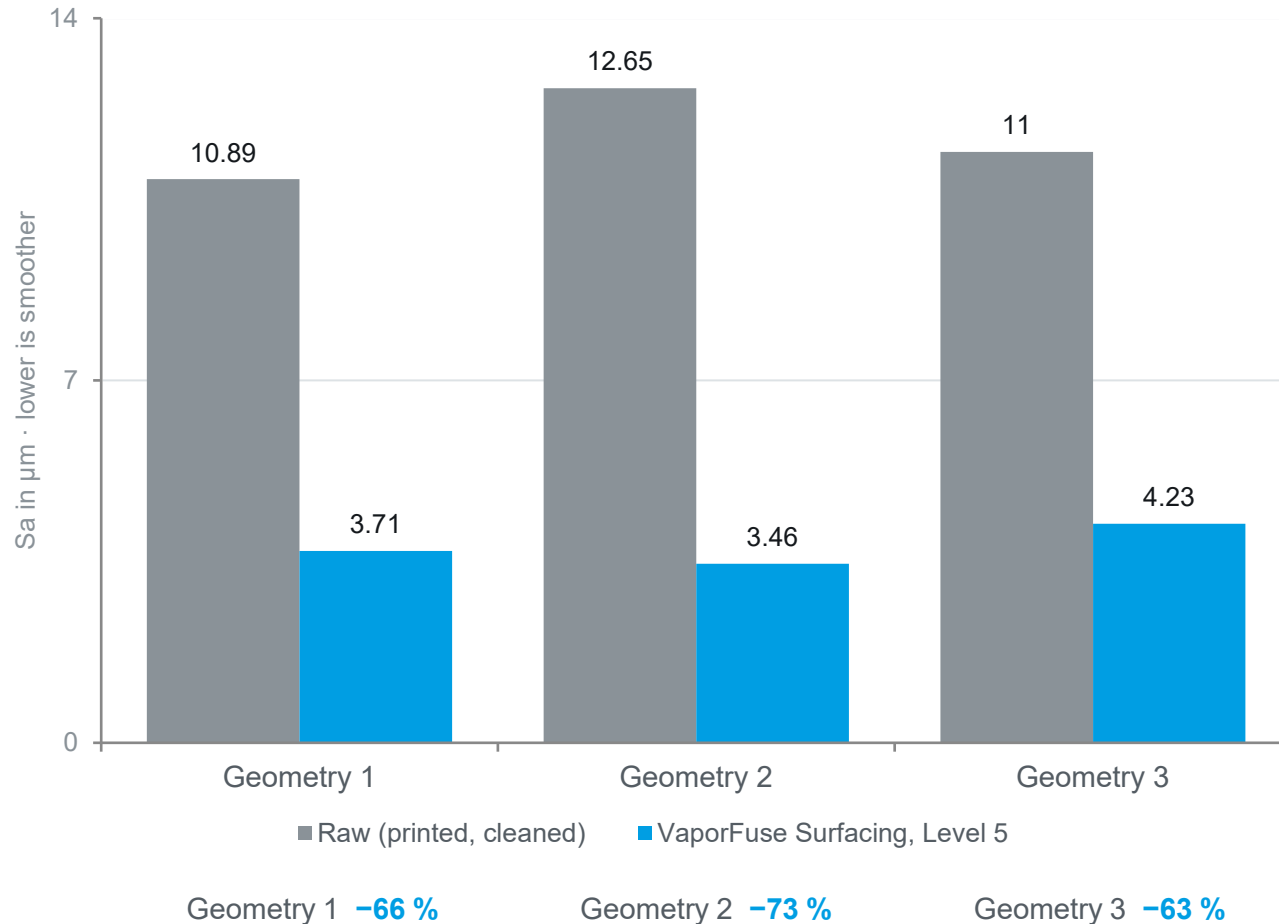
All parts printed on a Formlabs Fuse 1+ in Nylon 12, vapor smoothed with the DyeMansion VX1 (VaporFuse Surfacing, intensity level 5). Mechanical testing in an ISO/IEC 17025-accredited laboratory. Roughness to EN ISO 25178.



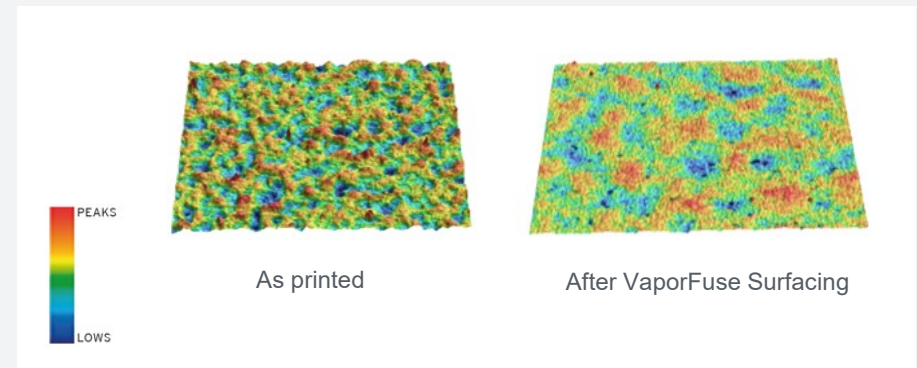
01 Surface Finish



Consistent, measurable improvements across surface finish, mechanical properties and dimensional accuracy. Roughness reduction of 63–73 % across all three geometries confirms process consistency across different part shapes. Sa is an areal surface parameter; values are not directly comparable to profile-based Ra measurements. Sa is the ISO 25178 areal parameter; it captures the full 3D surface rather than a single trace, which makes it the more representative measure for real part surfaces.



SURFACE TOPOGRAPHY



Measured to EN ISO 25178. All parts printed on a Formlabs Fuse 1+ in Nylon 12, vapor smoothed with the DyeMansion VX1 at intensity level 5. How the surface changes. Peaks and valleys of the raw SLS surface collapse into a continuous, sealed profile. After VaporFuse Surfacing, the height range narrows and peak density drops sharply. The resulting surface is comparable to fine-machined polymer parts and to the visual and haptic quality of injection-moulded components.

02 Mechanical Properties

Parts tested as printed, after VaporFuse Surfacing, and after extended drying — a controlled step in a vacuum oven to extract residual moisture and solvent. It shows that property changes after smoothing are solvent-driven and reversible over time under ambient conditions.

PROPERTY	AS PRINTED	VFS	Δ VS. PRINTED	VFS + EXT. DRYING	HOW TO READ IT
Tensile strength (MPa)	50.3	49.1	−2 %	52.7	Low impact from processing. Tensile strength remains within the as-printed range.
Charpy, unnotched (kJ/m ²)	11.7	22.9	+96 %	13.6	Impact resistance approximately doubles. A sealed, reflowed surface removes the micro-notches that initiate cracks under shock loading.
Shore hardness D	76	72	−5 %	77	Marginal. Fully recovered after solvent extraction.

Key finding: Property changes are process-driven and reversible

VaporFuse Surfacing increases ductility and impact resistance through surface re-flow and temporary solvent absorption. Stiffness and hardness reduce slightly as-smoothed and recover fully once residual solvent dissipates under ambient conditions. Impact strength remains elevated. The part can be tuned to the application: use as-smoothed for maximum toughness or allow solvent to fully dissipate for maximum stiffness.

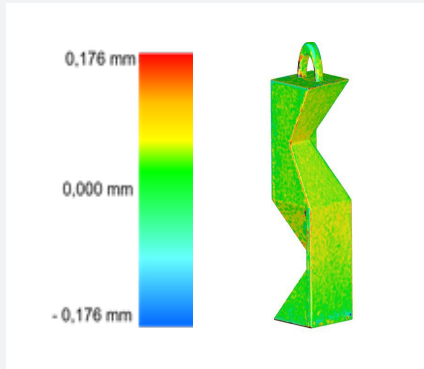
Test methods: ISO 527-2 tensile on Type 1A specimens · ISO 179-1 Charpy, unnotched · ISO 868 Shore D. Tensile modulus at 1 mm/min, tensile test at 50 mm/min; Δ calculated from the measured figures. Additional joint testing with Formlabs currently in preparation to broaden coverage to further orientations and test standards.

03 Dimensional Accuracy — and the joint evaluation



VaporFuse Surfacing is not an abrasive process. No material is removed. The outermost polymer layer re-flows, producing minimal and repeatable dimensional change. Deviation from smoothing is within printer tolerances and can be compensated in CAD.

ORIENTATION	3D MODEL	AS PRINTED	VFS FINISHED	Δ FROM SMOOTHING
X-direction	25.00 mm	24.992 mm	24.921 mm	−0.28 %
Y-direction	25.00 mm	24.597 mm	24.568 mm	−0.12 %
Z-direction	100.00 mm	99.929 mm	99.793 mm	−0.14 %



DIMENSIONAL ACCURACY

Deviation from nominal after VaporFuse Surfacing.
Green = within ± 0.05 mm.

JOINT EVALUATION WITH FORMLABS HQ, BOSTON

An in-house evaluation of the VX1 on Formlabs Fuse 1+ printed Nylon 12 has been carried out at Formlabs HQ, Boston.

Confirmed by joint evaluation:

- Full compatibility of the VaporFuse Surfacing process with Formlabs Nylon 12 across multiple runs and geometries.
- Homogeneous surface finish across chamber position, part orientation and run-to-run.
- No changes required to Formlabs' print parameters or workflow. The VX1 integrates as an added step after depowdering and blasting.

04 The VX1 in the SLS process chain



Fuse 1+

Print

Sift

Depowder

Blast

Clean

VX1

Seal & smooth

Color

Optional

Each step adds a distinct function: depowdering removes loose powder, blasting prepares the surface, vapor smoothing seals and finishes the part. No changes to the Formlabs print workflow.

THE VX1 IN NUMBERS

PROCESS CHAMBER **Ø 280 × 400 mm · 24.6 L**

CYCLE TIME **1.5 – 3 h**

ENERGY / CYCLE **< 1 kWh**

FOOTPRINT **660 × 450 mm**

WEIGHT **90 kg**

POWER **Single-phase 208 / 230 V, max.
14 A**

MATERIALS **PA12, PA11, TPU**

SETTINGS **Smoothing level 1–9, fill level,
thickness**

INSTALLED BASE **100+ systems**

WHY IT INSTALLS EASILY

- PFAS-free, food-grade solvent, classified non-hazardous — in a sealed cartridge, no operator contact
- No solvent cabinet, no extraction — runs on a standard single-phase outlet
- Closed loop: solution is refilled into the cartridge; used cartridges go through a return program
- Plug & play: three settings, little training, customer-serviceable

COMMERCIALS

SYSTEM **from €30,000 / \$36,000**
machine + standard package

RUNNING COST **from €20 / \$28**
per process cycle

CONSUMABLE **one cartridge per run**

DESIGN GUIDELINES

- Min. wall: 1.0 mm soft · 1.5 mm medium · 2.0 mm strong
- Channels smooth to a depth equal to their diameter
- Moving assemblies may adhere — design in clearance
- Part must fit Ø 280 × 400 mm



05 What the process delivers — and where it pays off



A SEALED, FINISHED SURFACE

Re-flows the outermost polymer layer: sealed, cleanable, gas- and liquid-tight, debris-free. The seal is integral to the part — nothing to chip, peel or delaminate.

FROM MATTE GREY TO DEEP BLACK GLOSS

A deep, uniform black with a high-gloss finish comparable to injection molding. No coating, no paint, no additional step — consistent across geometries and batch sizes.

THE COMPLETE POST-PROCESSING WORKFLOW

Blasting cleans and prepares the surface, vapor smoothing seals and finishes the part — ready for end use, with repeatable surface quality across runs.

Medical & Orthopedics (O&P)

Orthoses & prosthetics, protective masks, lab and test equipment, device housings.

Delivers Sealed, cleanable surface suited to skin-contact applications* — plus ductility to flex without cracking.

Food, Beverage & Packaging

Grippers, pick & place, fluid handling, covers, line components.

Delivers Cleanable, sealed surfaces that resist product residue and inhibit bacteria growth* — smoother flow through channels.

Industrial Tooling & Grippers

Tool inserts, machine and spare parts, brackets, jigs.

Delivers Cleanable, debris-free, production-ready surfaces — and the impact strength for parts handled on a line.

Consumer & Lifestyle

Eyewear, helmets, footwear, saddles, lattice structures.

Delivers The injection-moulded look buyers expect — and a surface that survives sweat, washing and daily handling.

Automotive & Mobility

Air & liquid pipes, ducts, covers, interior and spare parts.

Delivers Gas- & liquid-tight, durable parts — sealed against the media they carry.

Aerospace & UAV

Drone housings, air ducts, structural brackets, lightweight covers.

Delivers Homogeneous, sealed surfaces that support qualification* — with reduced drag on flight parts.

Electronics & Enclosures

Housings, enclosures, covers, cable and connector parts.

Delivers Gas- & liquid-tight protection for what sits inside — and a finish that looks like a product on a shelf.

Service Providers & Tech Labs

Small to mid-volume production, end-use parts, functional prototypes.

Delivers A premium finish as a sellable line item instead of an outsourced cost.

* Scope of these claims: the solvent used in the process is food-grade and classified non-hazardous. Suitability of a finished article for skin contact, food contact or any qualification regime depends on the application, the material and the customer's own validation, and is verified by the operator — not implied by the process. Not intended for infant-food contact.



Run a benchmark with your own parts

Send us your Formlabs Nylon 12 parts. We finish them on the VX1 and return them with a treatment report on your exact geometry. The most direct way to see what VaporFuse Surfacing does for your application.

[REQUEST A BENCHMARK](#)



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Left: as printed. Right: Formlabs Nylon 12 after VaporFuse Surfacing — same geometry, same build.