

Sterilization study of HP 3D High Reusability PA 12 W



Introduction

This study examines the impact of four different sterilization techniques on parts printed with HP 3D High Reusability (HR) PA 12 W material using the HP Jet Fusion 5420W 3D Printing Solution. The study focuses on evaluating changes in color, mechanical properties, dimensional accuracy, and part density.

Summary of data after sterilization

After sterilization, the data shows the following changes in the HP 3D High Reusability PA 12 W material:

- Retains strength and stiffness within a range of 5% to 25% change after sterilization.
- Shows a significant increase in elongation at break following sterilization of XY/YX specimens.
- Undergoes minimal changes in color and dimensional accuracy after sterilization.
- Increases in ductility, albeit at the expense of reduced stiffness and rigidity.

	% Change elongation at break (XY)	% Change Young modulus (XY)	% Change tensile strength (XY)	Color change	Relative shrinkage	Part density
Ethylene oxide sterilization	+ 56%	- 12%	- 8%	$\Delta E_{cmc} < 1$	< 1%	0.0%
Steam sterilization 121°C 30 min // 1 cycle	+ 91%	- 21%	- 13%	$\Delta E_{cmc} < 1$	< 1%	- 0.3%
Steam sterilization 121°C 30 min // 3 cycles repeated	+ 61%	- 24%	- 15%	$\Delta E_{cmc} < 2.5$	< 1%	- 1.5%
Steam sterilization 132°C 4 min // 1 cycle	+ 49%	- 12%	- 9%	$\Delta E_{cmc} < 1$	< 1%	- 0.2%
Steam sterilization 132°C 4 min // 3 cycles repeated	+ 52%	- 10%	- 7%	$\Delta E_{cmc} \sim 1$	< 1%	- 0.3%
Gamma 25-40 kGy sterilization	+ 36%	- 8%	- 7%	$\Delta E_{cmc} \sim 1$	< 1%	+ 1%
E-beam 25-40 kGy sterilization	+ 50%	- 13%	- 9%	$\Delta E_{cmc} < 1$	< 1%	+ 1%

Conclusions

The four sterilization processes studied here reveal similar behavior: an increase in ductility, a slight drop in strength and stiffness, and no change in color and dimension.

Disclaimer: These results are based on test conditions outlined above and the following specific printing conditions: 7 % packing density, with a ratio of 75% used powder and 25% new powder and specific parts orientations. The sterilization steps have been performed by an external company, the data from this study should not be extrapolated.

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