

ESD Print Mode for Multi Jet Fusion (MJF) Technology

Produce ESD-safe MJF parts for industrial applications using HP 3D HR PA 12, enabled by Evonik, and the HP Jet Fusion 5600 Series 3D Printing Solution.

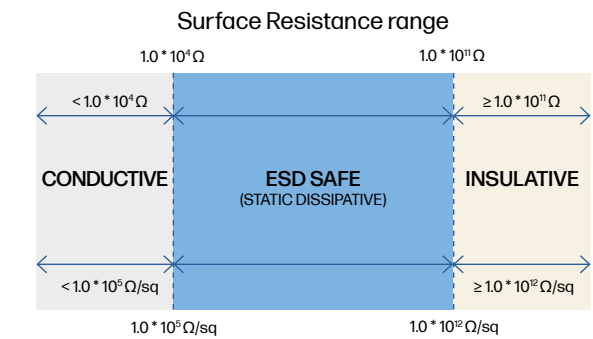
Surface Resistance

The ESD print mode produces parts that fall within the Static Dissipative range of Surface Resistance & Resistivity.

- 1e4 – 1e11 Ω Surface Resistance
- 1e5 – 1e12 Ω Surface Resistivity

Measurement tool: concentric ring for 100x100x3 mm plates and “two-points” probe for complex geometry (IEC 61340-2-3).

Measurement condition: at least 24°C and 60% RH.



Mechanical Properties

The ESD print mode applies an outer shell at a default thickness of 0.75mm that reduces surface resistance. The insulative core is equivalent to PA 12 Balanced print mode parts. The shell results in lower mechanical properties compared to PA 12 Balanced print mode. The thinner the cross section, the lower the properties.



ESD Print Mode, JF5600, HP 3D HR PA 12	Average (XY)	Average (Z)	Test Method
Tensile strength (MPa)	42	25	ASTM D638
Elongation at yield (%)	8,5%	3,0%	ASTM D638
Elongation at break (%)	9,5%	3,0%	ASTM D638
Tensile modulus (MPa)	1550	1300	ASTM D638

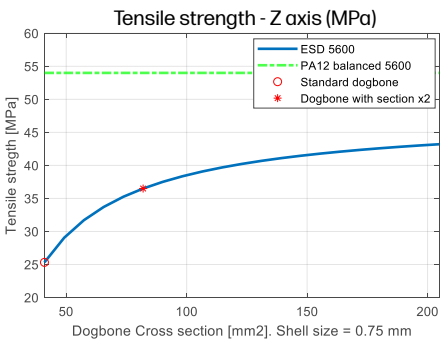
i. Based on internal testing and measured using the "HP PQ standard ESD". Results may vary with other jobs and geometries.
ii. Using HP 3D HR PA 12, 20% Fresh ratio, ESD Print Profile, natural cooling, and measured after bead-blasting with glass beads at 5-6 bars.
iii. Following al HP recommended printer setup and adjustment processes and printheads aligned using semi-automatic procedure.



How to increase mechanical properties?

- Bigger parts have properties closer to PA 12
- Reduce shell size via Front Panel (e.g. 0,75 mm → 0,5 mm)
- Avoid Z orientation for critical features

Theoretical relationship between part cross section and tensile strength



Dimensional Accuracy

Tolerances for C _{pk} = 1.00 (in mm) ^{i,ii,iii}	Nominal dimension					
	0 - 30 mm		30 - 50 mm		50 - 80 mm	
	XY	Z	XY	Z	XY	Z
With the general dimensional profile for the HP Jet Fusion 5600 Series 3D Printing Solution	±0.19	±0.34	±0.23	±0.40	±0.28	±0.47
i. Based on internal testing and measured using the "HP dimensional capability characterization job". Results may vary with other jobs and geometries. ii. Using HP 3D HR PA 12, 20% fresh ratio, ESD Print Profile, natural cooling, and measured after bead-blasting with glass beads at 5-6 bars. iii. Following all HP-recommended printer setup and adjustment processes and printheads aligned using semi-automatic procedure.						

Key Technical Recommendations

Primary Attributes	Primary recommendations	Additional Attributes	Additional recommendations	Implementing these recommendations, though optional, leads to more flexibility with primary recommendations
ESD shell thickness	≥ 0,75 mm	Post process	Vapor Smoothing (Tested with AMT Vapor Smoothing, PostPro SF Pure)	
Job design	Tilt parts Layer density < 20% & Packing density < 8%	ESD discharge path	Effective discharge paths: Silver Paint or Screw + Wire to ground	
Part design	“Bulky” parts MIN wall thickness > 3-4 mm	Air humidity	Relative humidity > 60% Room Temperature > 24°C	
Irradiance settings	Low irradiance settings	For full details, refer to the HP 3D MJF ESD Safe Guide, now on PrintOS		
Cleanning	Automatic Sand Blasting			
Air humidity	Environment with ESD part in use needs to be controlled. Minimum relative humidity 30%			

