Electrifi Conductive Filament

Product Type: Highly conductive copper-filled thermoplastic filament for additive manufacturing

Manufacturer: Multi3D, Inc.

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1. Product Description

Electrifi® is a highly electrically conductive polymer composite filament designed for fused filament fabrication (FFF/FDM). Unlike conventional carbon-based conductive plastics, Electrifi achieves metal-like conductivity through a percolated copper network embedded in a thermoplastic matrix. The material is optimized for printing functional electrical features such as conductors, contacts, heaters, antennas, and embedded electronics.

Electrifi is intentionally formulated as a **soft, low-modulus filament** to maximize electrical performance. As a result, it is best suited for **direct-drive, single-material extrusion systems** rather than long or constrained filament paths.

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2. Key Features

- Electrical conductivity orders of magnitude higher than carbon-filled plastics
- Processable on standard FFF 3D printers with appropriate setup
- Enables printed conductors, sockets, heaters, antennas, and EMI structures
- Compatible with hybrid electronics and polymer substrates
- No post-sintering required

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3. Typical Properties

Note: Values are typical and depend on print geometry, orientation, and processing conditions.

Electrical Properties

Property	Typical Value
Volume resistivity	0.001-0.1 Ω·cm
Electrical conductivity	1,000–100,000 S/m
Temperature Coefficient of Resistance (TCR)	Positive

Physical Properties

Property	Typical Value
Density	~2.0–4.0 g/cm^3 (formulation dependent)
Appearance	Metallic bronze color
Flexibility	Soft / highly flexible filament

Thermal Properties

Property	Typical Value
Recommended nozzle temperature	140–180 °C
Glass transition (polymer matrix)	Low (soft polymer system)
Continuous use temperature	≤ 45 °C (room temperature applications preferred)

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4. Printing Guidelines

Recommended Printer Configuration

- Direct-drive extruder strongly recommended
- Short, well-constrained filament path
- Single-material printing preferred
- Hardened steel or standard brass nozzle (≥0.4 mm)

Typical Print Settings

- Nozzle temperature: 140–160 °C
- Bed temperature: ≤50 °C
- Print speed: Slow to moderate (e.g., 10–30 mm/s)

Not Recommended

- AMS / multi-material feed systems with long filament paths
- High-speed printing profiles

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5. Design Considerations

- Electrical resistance is strongly influenced by **trace cross-section and length**
- Contact resistance often dominates system performance
- Mechanical compression improves electrical interfaces
- Avoid excessive heat exposure, which may degrade conductivity

6. Applications

- Printed electrical interconnects
- Embedded heaters and heating elements
- Antennas and RF structures
- EMI shielding and grounding features
- Low-voltage signal routing
- Research and prototyping of printed electronics

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7. Compatibility & Assembly

- Compatible with conductive epoxies and low-temperature metal alloys (e.g., Field's metal)
- Best electrical performance achieved through mechanical contact and compression
- Not intended for conventional soldering processes

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8. Storage & Handling

- Store in a dry environment
- Avoid tight bends during handling
- Use care when feeding due to filament softness

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9. Disclaimer

The information provided in this data sheet is based on typical values and experience. Actual performance depends on printer configuration, part geometry, processing conditions, and application environment. Users should validate material suitability for their specific application.

For additional guidance, application notes, or custom formulations, please contact Multi3D, Inc.