

# Hill Technical Sales

## Technical Datasheet: Surge Energy Optimization with Laminated Bus Structures

### Overview

Laminated bus bars are engineered to significantly reduce stray inductance, enabling faster, more efficient surge energy delivery in high-performance electrical systems. Through careful conductor layering and optimized geometry, these bus bars address performance limitations caused by traditional wiring methods and enhance overall system reliability.

### Key Benefits

**- Reduced Inductance:**

Mutual inductance cancellation via layered, opposing current paths

**- Compact Design:**

Space-saving configuration compared to wire harnesses

**- Improved Efficiency:**

Minimal stray inductance ensures effective energy transfer

**- Lower Thermal Stress:**

Reduced I<sup>2</sup>R losses and minimal heating under surge conditions

**- Enhanced EMI Control:**

Cancellation of magnetic fields minimizes electromagnetic interference

**- Modular & Scalable:**

Easily adapted to varying voltage, current, and form factor requirements

### Technical Highlights

Construction: Multiple conductive layers (typically copper or aluminum) separated by thin dielectric insulation (5-10 mils)

Inductance Reduction:

- Self-inductance: Lower than round conductors
- Mutual inductance: Significant cancellation between layers with opposing current flow

Dielectric Strength: Customizable based on application

Current Handling: Capable of 900 A and beyond (application-dependent)

Voltage Rating: Proven performance up to 1000 V DC and higher in laminated configurations

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### Application Use Cases

Capacitor Discharge Circuits, Pulsed Power Systems, EV Battery Modules, High-Frequency Power Converters, Critical UPS Systems, Traction & Rail Power Equipment

### How It Works

When high surge energy is transferred through traditional cables or bus bars, stray inductance acts as a limiting factor, delaying energy delivery and introducing losses. Laminated bus structures mitigate this by:

- Layering Conductors with current flowing in opposite directions
- Canceling Magnetic Fields to reduce total loop inductance
- Optimizing Geometry to minimize proximity and skin effects
- Enabling Compact Integration for low-profile, high-efficiency installations

### Design Considerations

For best performance, please provide:

- Load profile (voltage, current, surge characteristics)
- Schematic or hand sketch of the existing layout
- Dimensional constraints and mounting details

This data enables a tailored laminated bus structure design to match your system's energy delivery and layout needs.

### Conclusion

Laminated bus structures provide a high-performance, space-saving solution for surge energy applications by eliminating excess inductance, improving thermal performance, and enhancing overall system stability. They're ideal for demanding applications where traditional wiring methods fall short.

### Need Assistance?

Contact our engineering team to begin a collaborative design discussion or to request a quote based on your

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system requirements.

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