



Eaton's BAT1 bolt-down fuses offer reliable overcurrent protection in portable electric power tools

In the construction and maintenance industries, battery-powered power tools deliver efficiency, precision, and reliability across a range of applications. However, because these tools handle more demanding tasks, the power requirements have increased substantially, placing greater demands on internal electrical components. In addition, portable tools are intended for particularly harsh environments, characterized by dust, vibration, and temperature fluctuations. Consequently, reliable overcurrent protection is critical to protect sensitive components, ensure user safety, and maximize battery life and tool lifespan.

During operation, portable electric power tools experience rapid load changes, high inrush currents at startup, and potential short-circuit conditions if the tool binds or stalls. Overcurrent events could damage the tool's motor, battery pack, and control system, potentially resulting in hazards to operators and costly replacements. In addition, the mobile nature of battery-powered tools in industrial

environments exposes them to drops, moisture, and temperature fluctuations, further complicating protection requirements.

Overcurrent protection for portable electric power tools is becoming more challenging as the technology evolves. One reason for this is that conventional fuses and circuit protection devices often require mounting solutions that take up valuable space within a tool's compact housing, a crucial limitation as these tools become more compact yet more powerful. Moreover, as power tools advance to utilizing higher power levels, protection devices must handle higher currents during regular operation while effectively responding to fault conditions. Many solutions do not adequately balance the need for fast response with high current handling in professional-grade cordless tools.

To address these challenges, Eaton has designed its BAT1 family bolt-down fuses specifically for high-power applications, including portable electric power tools. These

small-footprint fuses provide overcurrent protection in even the most space-constrained battery tool designs. The BAT1 family offers current ratings from 30 A to 200 A, accommodating the full range of portable electric power tools, from compact drill drivers to heavy-duty cordless saws and rotary hammers. A high interrupting capacity of up to 1000 A at 58 Vdc ensures protection during the most severe fault conditions, preventing damage to expensive battery packs and enhancing operator safety. BAT1 family fuses operate in a wide operating temperature range, making them suitable for tools used in diverse environments, from cold outdoor worksites to hot attic spaces.

The physical design of the BAT1 fuses offers several benefits for portable electric power tool applications. Their bolt-down configuration ensures that electrical connections remain stable despite the physical shocks and vibrations experienced by handheld tools. Unlike standard fuse clips, which can loosen over time, the

BAT1 fuses' firm mounting also minimizes connection resistance and reduces heat generation that may occur during high-current battery discharge. Their compact size also saves considerable space within battery tool enclosures, allowing designers to create more ergonomic, lightweight tools without compromising protection capabilities.

Eaton's BAT1 family fuses meet the stringent requirements of portable electric power tool applications with tin-plated terminals with M5 bolt holes providing versatile mounting options and excellent corrosion resistance. These fuses are also UL-certified to meet global standards, simplifying compliance for tool manufacturers in international markets. Manufacturers can work with Eaton's application engineers to select the optimal fuse rating for their specific battery-powered tool design, achieving the best balance of protection and performance. This collaborative approach can help manufacturers optimize their overcurrent protection strategy based on battery voltage, current demands, and duty cycle requirements.

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Printed in USA
Publication No. ELX1528 BU-ELX22425
Publish date: September 2025

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