

ZT68-600MPa Al Bolt for Mg Lightweighting

The dual-carbon strategy and the push for extended EV range are accelerating the widespread adoption of magnesium alloy die-casting lightweight solutions. Core components such as battery trays, e-drive housings, and chassis die-castings have already achieved mass production deployment. However, traditional fasteners suffer from poor compatibility, creating a critical technical bottleneck for the industrialization of magnesium alloy lightweight structures. Two major industry pain points persist:

Galvanic corrosion from steel-magnesium dissimilar pairing: Magnesium alloy has an electrode potential of $-1.6V$, while carbon steel is only $-0.44V$ – a significant potential difference. Under wet conditions, water exposure, and condensation, this triggers galvanic reactions, causing corrosion of the magnesium matrix, thread degradation, component leakage, structural failure, and drastically shortened service life.

Thermal expansion mismatch leading to loosening under cyclic conditions: Magnesium alloy has twice the thermal expansion coefficient of steel. During temperature cycling and start-stop vibration, the inconsistent deformation between steel bolts and the magnesium matrix causes continuous preload loss, resulting in sealing failure, abnormal noise, and bolt loosening – compromising NVH performance and structural reliability.



Currently, the industry-standard 6056 (420MPa) aluminum bolts offer only marginal corrosion improvement but suffer from insufficient strength and load-bearing capacity. They cannot meet the high-torque, high-load, and long-life demands of new energy vehicle e-drive systems, nor support large-scale deployment of high-end magnesium alloy lightweight structures.

Leveraging over two decades of precision fastener R&D and manufacturing experience, ZCJ has independently developed the ZT68-600MPa cold-headed high-strength aluminum alloy bolt – a one-stop solution addressing corrosion, loosening, and insufficient strength in magnesium alloy connections, delivering a highly reliable dedicated fastening solution for new energy vehicle lightweighting.

I. Hardcore Performance – Comprehensive Superiority over Traditional 6056 Aluminum Bolts

Using the mainstream M8×40 external hexagon flange bolt as the test benchmark, the ZT68-600MPa high-strength aluminum alloy bolt delivers comprehensive upgrades in strength, toughness, and stability, far surpassing the industry-standard 6056 (AL9) 420MPa aluminum alloy bolt:

Performance Parameter	ZT68-600MPa High-Strength Aluminum Bolt	Industry 6056 (AL9) 420MPa Aluminum Bolt	Performance Improvement
Tensile Strength Rm	~630MPa	~420MPa	~ +50%
Yield Strength Rp0.2	~500MPa	~350MPa	~ +43%
Yield-to-Tensile Ratio	~0.8	~0.85	Superior plastic reserve
Elongation	≥8%	≥6%	Higher strength with retained toughness

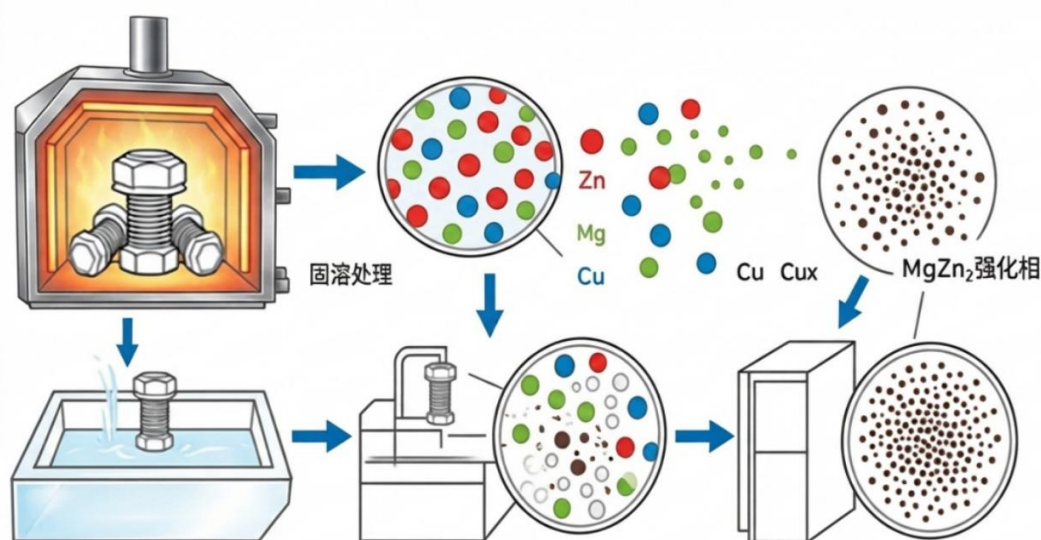
Tough, durable, heat-resistant, and fatigue-resistant: Robust and stable structure with uniform hardness, no stress concentration, and excellent resistance to high-frequency vibration fatigue. Long-term service at 150°C with stable strength above 600MPa – no creep or relaxation, perfectly suited for high-temperature e-drive conditions.

Matched potential – complete elimination of galvanic corrosion: Potential-matched to magnesium alloy, eliminating corrosion risks associated with steel fasteners. Passed intergranular corrosion testing; with proprietary anodizing treatment, reliably passes 60-day neutral salt spray testing – ideal for high-humidity, corrosive environments in e-drive and battery pack applications.

Synchronized deformation – eliminating loosening, leakage, and noise: Thermal expansion coefficient closely matched to magnesium alloy, ensuring synchronized deformation under thermal cycling, significantly reducing preload decay. Fundamentally solves loosening, leakage, and abnormal noise issues while enhancing structural reliability.

High precision and consistency – ready for automated mass production: Proprietary three-stage lubrication system ensures stable friction coefficient of 0.09–0.15, with uniform tightening torque and low dispersion – compatible with fully automated assembly lines. Entirely cold-headed and self-developed in-house, with performance superior to machined parts and full quality traceability.

Lightweighting for extended vehicle range: With a low density of 2.7g/cm^3 , achieves significant weight reduction over traditional steel bolts. Batch deployment can improve vehicle range by 6%–8%, perfectly aligning with new energy lightweighting, energy reduction, and range extension requirements.



ZT68-600MPa Cold-Heated High-Strength Aluminum Alloy Bolt – Heat Treatment

II. Core Application Scenarios

The product is custom-designed for magnesium/aluminum alloy lightweight structures in new energy vehicles, suitable for thermal cycling, high-frequency vibration, moisture, and corrosion. Key application areas:

E-drive systems: Fastening of magnesium alloy motor housings, reducer flanges, and e-control enclosures.

Traction battery systems: Structural connections for magnesium alloy battery trays, box frames, and cold plates.

Lightweight chassis: Fastening of magnesium/aluminum control arms, steering knuckles, subframes, and other chassis structures.

Large magnesium die-castings: Fixing of instrument panels, interior trim, and other large lightweight structural components.

Magnesium alloy lightweighting in new energy vehicles is an undeniable industry trend. Traditional steel bolts and low-strength 6056 aluminum bolts can no longer meet the high-reliability, long-life, and high-range requirements of modern vehicles. ZCJ's ZT68-600MPa high-strength cold-headed aluminum bolt – with its self-developed modified aluminum material, breakthrough cold-heading technology, and comprehensive rigorous testing – removes the technical barriers in magnesium alloy lightweight connection technology, delivering a lighter, stronger, more stable, and more durable integrated fastening solution that empowers OEM lightweighting upgrades and enhances quality and efficiency.