



ZA-8 vs ZA-12 Zinc Alloys

—A Comparative Analysis of Properties, Processes and Applications

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I. Overview of the ZA Alloy Series

ZA alloys (ZA-8, ZA-12, ZA-27) were introduced in 1959 as gravity casting alloys. Through subsequent research and development, their chemical compositions were refined and their applications were successfully extended to die casting. The alloys are named with the prefix "ZA" followed by a number, which represents the approximate nominal aluminum content. Unlike the Zamak series (which contains approximately 4% aluminum), the ZA series has higher aluminum and copper contents.

Common advantages of ZA alloys include:

- **High Strength:** Tensile strength significantly higher than Zamak series
- **Excellent Wear Resistance:** Ideal replacement for bronze bearings
- **Superior Creep Resistance:** Resistant to deformation under long-term loading
- **Lower Density:** Lighter than Zamak series, supporting lightweight design

The series comprises three main grades: ZA-8, ZA-12, and ZA-27. This article focuses on the comparison between ZA-8 and ZA-12.

II. Performance Comparison

Property	ZA-8	ZA-12
Nominal Aluminum Content	8.2-8.8%	10.8-11.5%
Nominal Copper Content	0.9-1.3%	0.5-1.2%
Tensile Strength	Approx. 386 MPa	Approx. 400 MPa
Hardness LHBM	95-110	95-115
Density (g/cm³)	6.3	6.0
Melting Point	375-404°C	377-432°C
Casting Method	Hot-Chamber Die Casting	Cold-Chamber Die Casting
Platability	Good (same as Zamak)	Good (process adjustment required)
Creep Strength	Highest among all zinc alloys	Excellent

Property	ZA-8	ZA-12
Wear Resistance	Excellent	Excellent (superior bearing performance)

Key Interpretations:

- **Performance gap is moderate:** ZA-8 tensile ~386 MPa vs ZA-12 ~400 MPa.
- **The real dividing line is the casting process:** ZA-8's lower aluminum content gives it a lower melting point, allowing compatibility with hot-chamber die casting. ZA-12's higher aluminum content necessitates cold-chamber die casting.

III. Casting Process Differences(Core Selection Basis)

Alloy	Hot-Chamber Die Casting	Cold-Chamber Die Casting	Sand Casting	Permanent Mold	Graphite Mold
ZA-8	✔ Recommended	✔	✔	✔	✔
ZA-12	✗	✔ Required	✔ Best	✔ Recommended	✔

- **ZA-8: The only ZA alloy suitable for hot-chamber die casting.** This provides high efficiency, lower equipment costs, and faster cycle times. It is the **strongest hot-chamber zinc alloy** and has **the highest creep strength** among all zinc alloys.
- **ZA-12:** Its higher aluminum content dictates cold-chamber die casting. It is recognized as the best gravity casting alloy for sand and permanent mold processes.

IV. Applications & Typical Hardware Components

ZA-8:

Application Field	Typical Components	Key Advantage
Automotive	4WD locking hub covers, automotive components	Net-shape capability, creep resistance
Industrial Machinery	Base plates, shaft supports	Superior mechanical properties and dimensional stability
Electronics	High-precision components requiring high strength	Good impact strength and dimensional stability
Aerospace	High-performance die-cast components	Excellent strength, wear resistance, and dimensional stability
Medical Devices	Central support units for imaging plates	Precision fit and long-term reliability
Hardware	Bolt rails (replacing machined steel parts)	Near-net shape, cost reduction
Sanitary Hardware	Faucet bodies	Near-net shape, tolerances to 0.005 inch

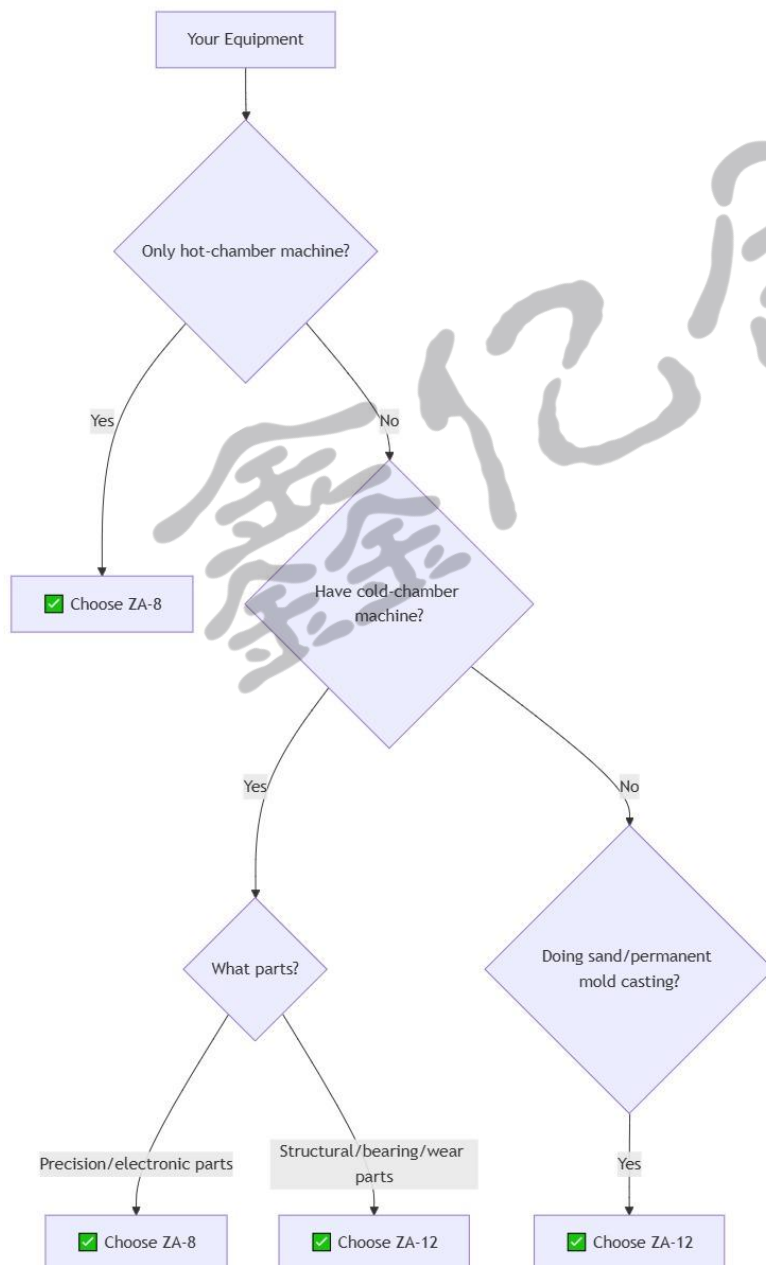
ZA-12:

Application Field	Typical Components	Key Advantage
Automotive	Seat belt components, structural parts	Sufficient strength, good castability

Application Field	Typical Components	Key Advantage
Industrial Wear Parts	Bearings, bushings, liners (bronze replacement)	Superior bearing performance, 40 – 60% cost saving
Mining Equipment	Ventilation fan bearings, wear-resistant liners	High wear resistance, 17% weight reduction, 30% cost saving
Electronics & Telecommunications	Heat sinks, connectors, electrical switch cams	Electrical conductivity, shielding performance
Defense	Gunner control handles and mounting boxes	Graphite permanent mold casting, economical for small batches
General Structural Parts	Housings, connectors, fasteners	Good castability, high strength, and cost-effectiveness.

V. Selection Decision Flowchart

Choose based on your equipment:



VI. One-Sentence Summary

- ZA-8: The only ZA alloy suitable for hot-chamber die casting; highest strength among hot - chamber alloys; ideal for high-precision, thin-wall complex die castings.
- ZA-12: The preferred choice for cold-chamber die casting and gravity casting; superior bearing performance and higher strength; suitable for heavy-load wear-resistant components.

Choose based on your equipment first, then evaluate performance. Equipment compatibility is the prerequisite; performance is the differentiator.

VII. Interaction

Does your plant use hot-chamber or cold-chamber die casting machines? Which one have you used – ZA-8 or ZA-12? Welcome to share your experience.



About Us

Foshan Xinyihehui Metal Technology Co., Ltd. operates under the zinc alloy brand “**Xinyi Zinc**,” specializing in the R&D and production of high-purity primary zinc alloy ingots. Our product

Range covers the full Zamak series (No.3, No.5, No.2), ZA series (ZA-8, ZA-12, ZA-27), and customized master alloys, serving die casting, hardware, automotive, electronics, and machinery industries.

Our “133+ Process” —in-house master alloy, three furnaces, and three purifications —ensures batch-to-batch composition deviation $\leq \pm 0.5\%$, delivering consistent quality and stability.
performance.

Contact Us

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