ZINC CASTING ALLOYS

This guide is to help designers and material specifiers to better understand the capabilities of zinc casting alloys for product applications.

ADVANTAGES
Zinc casting alloys are versatile engineering materials. No other alloy system provides the combination of strength, toughness, rigidity, bearing performance and economical castability. Listed are zinc alloy attributes which can reduce component costs. Improving precision, quality and product performance are other zinc alloy design advantages discussed in this brochure.

Process Flexibility:
Virtually any casting process can be used with zinc alloys to satisfy virtually any quantity and quality requirement. Precision, high-volume die casting is the most popular casting process. Zinc alloys can also be economically gravity cast for lower volumes using sand, permanent mold, graphite mold and plaster casting technology.

Zinc alloys are castable to closer tolerances than other metals or molded plastics, therefore presenting the opportunity to reduce or eliminate machining. "Net Shape" or "Zero Machining" manufacturing is a major advantage of zinc casting.

Strength & Ductility:
Zinc alloys offer high strengths (to 60,000 psi) and superior elongation for strong designs and formability for bending, crimping and riveting operations.

Toughness:
Few materials provide the strength and toughness of zinc alloys. Impact resistance is significantly higher than cast aluminum alloys, plastics, and grey cast iron.

Rigidity:
Zinc alloys have the rigidity of metals with modulus of elasticity characteristics equivalent to other die castable materials. Stiffness features are, therefore, far superior to engineering plastics.

Anti-Sparking:
Zinc alloys are non-sparking and suitable for hazardous location applications such as coal mines, tankers and refineries.

Bearing Properties:
Bushing and wear inserts in component designs can often be eliminated because of zinc’s excellent bearing properties. For example, zinc alloys have outperformed bronze in heavy duty industrial applications.

NO. 2
No. 2 alloy castings are the most common die castings in zinc, due to its ability to produce very thin wall sections. ZA-27 is the high strength, hardness and creep properties over ZAMAKs, with reduced impact performance (to levels similar to aluminum alloys) for die cast products.

Although No. 2 alloy exhibits excellent castability, it has seen limited use by die casters in North America. It does, however, provide some interesting characteristics which may assist designers. Its creep performance is rated higher than the other ZAMAKS and No. 2 maintains higher strength and hardness levels after long term aging. Also, preliminary investigations suggest No. 2 alloy is a good bearing material, and may eliminate bushings and wear inserts in die cast designs.

ZA-8
A good gravity casting alloy, ZA-8 is rapidly growing for pressure die casting. ZA-8 can be hot chamber die cast, with improved strength, hardness and creep properties over ZAMAKS, with the exception of a No. 2 alloy which is very similar in performance. ZA-8 is readily plated and finished using standard procedures for ZAMAKS. When the performance of standard No. 3 or No. 5 is in question, ZA-8 is often the die casting choice because of high strength and creep properties and efficient hot chamber castability.

ZA-12
ZA-12 is the highest strength performer of the zinc alloys, whether for gravity or pressure die casting (cold chamber). It is also the lightest alloy and offers excellent bearing and wear resistance properties. ZA-27, however, requires care during melting and casting to assure sound internal structure, particularly for heavy wall sections. It may also need a stabilization heat treatment when tight dimensional tolerances are required. ZA-27 is not recommended for plating. However, when brute strength or wear resistant properties are needed, ZA-27 has demonstrated extraordinary performance.