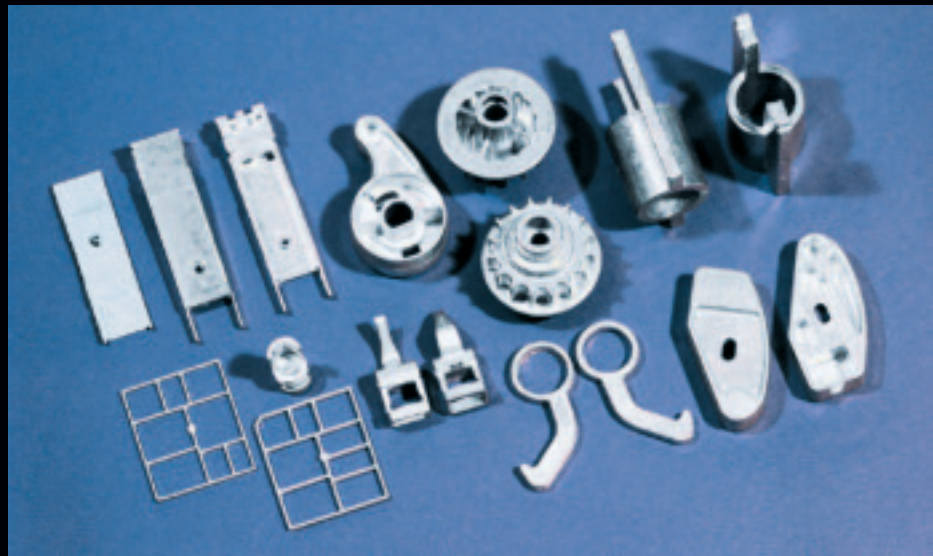


Chicago White Metal Casting, Inc.

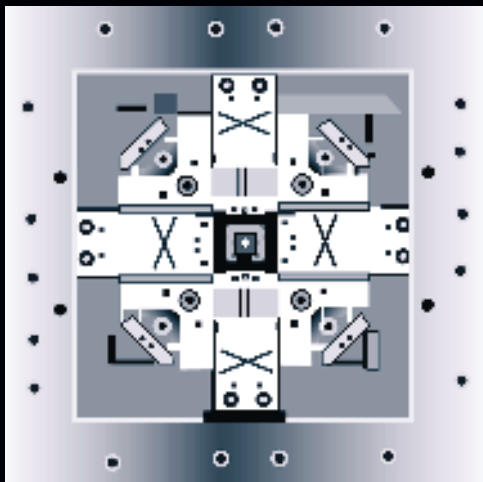
**A New Generation of
Net-Shape Die Cast Production for
Miniature Zn & ZA-8 Components**



**CWM
MINIATURE ZINC
AND ZA-8
DIE CASTING
CAPABILITIES**



Specialists in delivering miniature die cast parts with any required post-casting finishing operations, including precision machining where net-shapes are not possible.



Net-shape miniature die castings at low unit & tooling costs

New Generation of Miniature Zn & ZA-8 Parts from CWM

CWM specializes in delivering miniature parts to final specifications, ready for further assembly. This includes any required post-casting machining when net-shape casting is not possible, as well as any specified surface treatment and/or final finishing. You are assured of all the cost-saving benefits of substituting these miniature precision Zn & ZA-8 cast parts for other more costly processes.

Advances in multi-slide, hot-chamber zinc die casting have established this technology as the process of choice for complex miniature precision components.

Chicago White Metal Casting offers OEMs the benefits of this flash-free, net-shape production processing in part weights from fractions of an ounce to 3/4 lbs., in sizes from minuscule to 4 x 4 x 1 in.

Tighter Tolerances, Faster Cycling

While high precision miniature die casting is similar to hot-chamber die casting of much larger parts, it is capable of holding tighter

tolerances. Complex designs of miniature parts are capable of holding tolerances with virtually no "part to part" variation, often with zero draft, to net shapes as-cast at much faster cycle times.

Complex designs of miniature parts can be routinely held to tolerances of less than 0.001 in., with virtually no "part to part" variation.

Enhanced Component Quality

Part quality is further enhanced by reduced shrinkage and the elimination of secondary operations. Minimal shrinkage in small parts makes it easier to hold tolerances on hole locations and other features. Eliminating post-casting machining leaves the hard, dense surface of the casting undisturbed, with increased wear resistance and strength.

Low Unit Costs, Low Die Investment

Micro-miniature components, produced on automated 4-slide machines, can deliver unit costs down to pennies per piece, at extremely low die investment. Technological innovations have brought the advantages of the process to a wider and wider range of parts.

Recommended Alloys

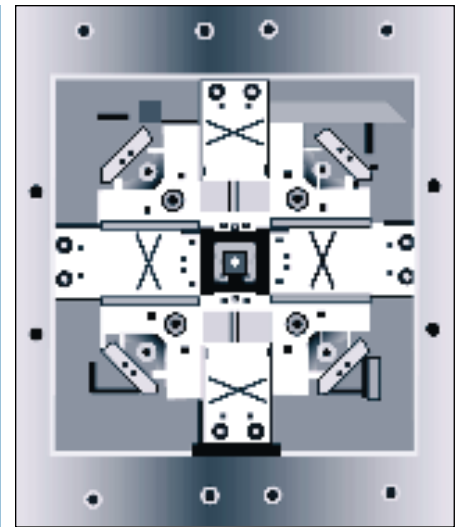
CWM offers multi-slide part production in the full range of the most commonly used zinc alloys, Zamak 2, 3, 5, 7 and ZA-8.

Zinc No. 3 is the most widely used of the Zn alloys, offering the mechanical properties of medium-strength metals, castability at high cycle speeds with optimum economics. It facilitates complex shapes, thinner wall sections, excellent surface finish and higher standards of dimensional accuracy.

Zinc-aluminum alloy ZA-8 can be specified for higher strength, excellent wear resistance and superior creep strength.

Comparisons with Other Processes

Parts die cast by the miniature multi-slide process can economically replace metal components manufactured by a variety of other processes, as well as small plastic parts, often



This 4-slide die, unique to the miniature hot-chamber die casting process, offers exacting part casting accuracy for intricate design features, at high cycle speeds—virtually flash free.

with a substantial cost savings or significant performance improvement. External threads are castable in unlimited configurations.

Zn and ZA-8 parts are stronger and more rigid than plastic parts, comparing favorably with the mechanical properties of powdered iron and brass or steel screw machining. Dramatic cost reductions can be shown over stamping, powdered metal and cold heading.

Compared with conventional die casting, 4-slide miniature dies and processing allow the casting of undercuts for many part designs not otherwise possible.

Single-cavity dies insure exacting part-to-part consistency, with high production rates routine. Where very large volumes are required, multiple-cavity dies can be used.

Cost Savings vs Screw Machined Parts

In the case of small brass screw machined parts, miniature Zn die castings can be used to achieve virtually all of the properties of brass at significant cost savings. With certain steel screw machine designs, ZA-8 can be used to achieve strength and wear resistance specifications at a cost reduction.

Any Required Surface Finishing

Miniature die cast parts are often used "as-cast," with no further surface treatment. CWM offers a range of surface finishes which can be applied to its zinc parts to enhance aesthetic appeal, increase corrosion resistance and improve mechanical properties.

Conversion/functional finishes, platings,

(Continued)

Chicago White Metal Casting Miniature Die Casting Specifications

Zinc No. 2, 3, 5, 7 & ZA-8

Part Size	Minuscule ^(a) to 4 x 4 x 1 in. (10.16 x 10.16 x 2.54 cm)
Part Weight	Less than 1/10 oz.(2 g) to 3/4 lb.(340 g)
Linear Dimensions	+/- 0.0015 in.(+/- 0.0381 mm)

^(a)Miniature die casting has virtually no lower size limits.

(Continued from previous page)

paints and powder coatings are the most common surface finishes recommended.

New non-toxic Trivalent chromate conversion treatments are now used to improve a part's corrosion resistance, replacing former toxic hexavalent coatings.

Common platings applied to miniature zinc parts are nickel, brass, copper, tin, silver, and gold, usually for cosmetic purposes. Plating also enhances conductivity, corrosion resistance, wear resistance and solderability.

Paint finishes are applied for decoration and protection, and altering surface friction.

Powder coatings are widely used for an attractive, protective finish. They cover especially evenly and provide corrosion resistance.

Design Assistance & Prototyping

For OEMs new to miniature die casting, CWM can provide engineering guidance to optimize designs for miniature multi-slide production. This assistance includes 3-D computer modeling and a variety of prototyping alternatives, working directly from customer CAD files. CNC machined prototypes or RP "rapid prototyping" can be provided for part evaluation prior to final die design/build sign-off.

Post-Casting Machining if Required

Among the major advantages of the miniature process is its ability to die cast complex net-shape, flash-free parts with specified features and tolerances as-cast, requiring no post-casting machining, with even gate removal eliminated by automated degating. When an unusual geometry does require further machining operations, CWM provides a complete range of CNC machining capabilities.

CWM Contract Manufacturing

With a depth of experience in subassembly production, CWM can offer special efficiencies and complete flexibility in performing this manufacturing role. Work can range from limited assembly to comprehensive single-source turnkey subassemblies, with procurement of all non-die cast components.

For NADCA's Miniature-specific Die Casting Design and Specification Standards, contact your regional CWM Sales-Engineer, or the CWM Sales Dept., or visit the "Reference Manuals" section at our OEM DC² Die Casting Design Center at: www.cwm diecast.com

For more on the die casting design guides and content of the DC² Design Center, see the back cover, lower left.

MATERIAL PROPERTIES & NOMINAL CHEMISTRY

Table 1 Typical Material Properties: Zinc 2, 3, 5, 7 & ZA-8 Die Casting Alloys

Typical alloy values based on "as-cast" characteristics for separately die cast specimens, not specimens cut from production die castings. (2000 NADCA Standards)

Commercial: ANSI/AA:	Zinc & ZA Hot-Chamber Die Casting Alloys				
	Zn 2	Zn 3	Zn 5	Zn 7	ZA-8
	AG-40A	AC-41A	AG-40B		
MECHANICAL PROPERTIES					
Ultimate Tensile					
ksi (MPa)	52 (359)	41 (283)	48 (328)	41 (283)	54 (372)
Yield Strength[Ⓐ]					
ksi (MPa)	41 (283)	32 (221)	39 (269)	32 (221)	41-43 (283-296)
Elongation					
% in 2 in. (51 mm)	7	10	7	13	6-10
Hardness[Ⓑ]					
BHN	100	82	91	80	100-106
Shear Strength					
ksi (MPa)	46 (317)	31 (214)	38 (262)	31 (214)	40 (275)
Impact Strength					
ft-lb (J)	35 (47.5)	43 [Ⓔ] (58)	48 [Ⓔ] (65)	43 [Ⓔ] (58)	24-35 [Ⓔ] (32-48)
Fatigue Strength[Ⓒ]					
ksi (MPa)	8.5 [Ⓓ] (58.6)	6.9 (47.6)	8.2 [Ⓓ] (56.5)	6.9 [Ⓓ] (47.6)	15 (103)
Young's Modulus					
psi x 10 ⁶ (GPa)	Ⓔ	Ⓔ	Ⓔ	Ⓔ	12.4 (85.5)
PHYSICAL PROPERTIES					
Density					
lb/in ³ (g/cm ³)	.24 (6.6)	0.24 (6.6)	.24 (6.7)	.24 (6.6)	0.227 (6.3)
Melting Range					
°F (°C)	715-734 (379-390)	718-728 (381-387)	717-727 (380-386)	718-728 (381-387)	707-759 (375-404)
Specific Heat					
BTU/lb°F (J/kg°C)	.10 (419)	0.10 (419)	.10 (419)	.10 (419)	0.104 (435)
Coefficient of Thermal Expansion					
μ in./in./°F x 10 ⁻⁶ (μ m/m°C)	15.4 (27.8)	15.2 (27.4)	15.2 (27.4)	15.2 (27.4)	12.9 23.2
Thermal Conductivity					
BTU/ft hr °F (W/m°C)	60.5 (104.7)	65.3 (113)	62.9 (109)	65.3 (113)	66.3 (115)
Electrical Conductivity					
% IACS	25.0	27.0	26.0	27.0	27.7

Table 2 Nominal Chemical Composition: Zn & ZA-8 Die Casting Alloys

For detailed chemical composition, see 2000 NADCA Standards or contact CWM.

Nominal Composition:	Al 4.0 Mg 0.035 Cu 3.0	Al 4.0 Mg 0.035 Cu 3.0	Al 4.0 Mg 0.013 Ni 0.013 Cu 1.0	Al 4.0 Mg 0.013 Ni 0.013 Cu 1.0	Al 8.4 Mg 0.023 Cu 1.0

Ⓐ 0.2% offset Ⓑ 500 kg load, 10mm ball Ⓒ Rotary Bend 5 x 10⁷/10⁸ cycles Ⓓ Notched Charpy.

Ⓔ ASTM E 23 unnotched 0.25 in. die cast bar Ⓕ Varies with stress level; applicable only for short-duration loads. Use 10⁷ as a first approximation. Source: International Lead Zinc Research Organization.

Tap the CWM design and production resource.

If you have yet to visit the 136,000 sq. ft. facility of Chicago White Metal, consider doing so before your next design project. CWM engineering representatives are available to you across the United States and in Canada and Mexico. They can discuss feasibility of CWM high-tech die casting or turnkey contract manufacturing & assembly for a current product program, or arrange a plant visit.



**Chicago
White Metal
Casting, Inc.**



Certified Aluminum, Magnesium & Zinc Die Casting
and Miniature Zinc & ZA-8 Die Cast Parts

EXCELLENCE IS EXPECTED

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MEMBER:

North American Die Casting Association

International Magnesium Association



Browse CWM's DC2

(Die Cast Design Center)

Over 70 die casting
design guides & bulletins
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product designers and
engineers for download
24/7 at our website:

<http://dc2.cwmdiecast.com>

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