



## 10 “Mini” Case Studies for Mini-Zinc Parts

Brief snippets of Case Studies for CWM Miniature Zinc Die Casting Projects

### Chicago White Metal Casting

High Tech Al, Mg, & Zn Die Casting and  
Miniature 4-Slide Zn & ZA-8 Die Cast Parts

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### OVERVIEW

Miniature zinc die casting is a precision die casting process which addresses the need for smaller component production. The process is similar to conventional hot chamber die casting, but has the ability to produce castings with faster cycle times, tighter tolerances, and minimal value-added operations. It can also be an economical replacement for other processes such as screw machine or stamping.

These miniature parts can be cast with great precision in comparison to larger die castings. Thin walls, minimal flash, and ability to produce complex geometries are among the benefits of choosing miniature die casting for smaller parts. Miniature die casting can be used in many different industries such as: medical, military/government, electronics, computers & peripherals, lawn & garden, telecommunications, global positioning services (GPS), lighting, consumer products, automotive, and many others.

Using four-slide machines and single cavity tools, cycle times are significantly faster than conventional die casting, yet still offer great accuracy and repeatability. With a single cavity tool, tolerances of +/- .001 of an inch are possible on select features. This becomes a crucial advantage as parts get smaller, as costly secondary machining can be avoided. If larger volumes are required, it is not uncommon to utilize multiple cavity tooling.

Following this introduction are 10 examples of CWM projects in miniature zinc die casting.



### Electronics: Interactive Whiteboard Support

The miniature zinc part shown above is used in an Interactive Whiteboard, which is a large touchscreen used for presentations, classroom settings, training sessions, etc. The “legs”, or brackets, on this component support the whiteboard, and the through-holes are used to mount the camera.

**Finishing:** This mini zinc casting was lightly blasted to remove flash and even out the finish, for improved cosmetic appearance.

#### Challenges:

- 1) The bracket legs were difficult to incorporate for this casting – the balance of material strength, efficient metal flow, and creating a net-shape part were all made possible by CWM.
- 2) The stiffness of the part was another concern in the beginning, especially in the de-gating process. Chicago White Metal delivered by producing a solid, strong casting for this project.





### Electronics: PCB Board Connector

The mini zinc die cast part shown above is used in a Printed Circuit Board, or a PCB. A PCB mechanically supports and electrically connects electronic components using conductive tracks, pads, and other features that are engraved into copper sheets and laminated onto a non-conductive substrate.

This part was an internal component within the PCB Board that connected one area to another.

**Finishing:** This component was cast, machined and copper/nickel plated. The plating finish was used to protect against corrosion.

#### Challenges:

- 1) The main challenge in this part was integrating the contact points on the backside. These contact points were critical and needed to be accurate, as they would ultimately come in contact with the PCB board to complete the circuit in the finished assembly.



### Electronics: PCB Board Component

The miniature zinc die casting shown above is another part that is used in the same PCB Board assembly as the PCB Board Connector, but with a different purpose.

**Finishing:** This die cast part was cast, machined and aluminum oxide blasted. This aluminum oxide blast finish is used to improve the aesthetics of the part.

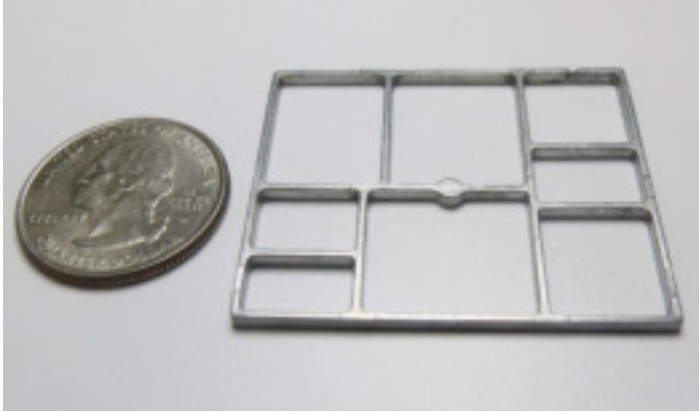
#### Challenges:

- 1) The main challenge with this die casting was a critical feature, which protrudes from the casting. This feature comes into contact with a part of the PCB Board that completes a circuit, so the entire assembly functions correctly in its application.

Because of the shape of this particular casting and the location of the contact point, perpendicularity was also a critical factor in the design of this part.

#### “Mini” Advantage

*The benefit of creating this part in a miniature zinc die casting machine was the ability to cast flatness more effectively than in a conventional die casting machine.*



### Global Positioning System: PCB Connector

Global positioning systems, or GPS for short, are used to track the position and coordinates of a device location, relative to a global map and grid. The miniature zinc die casting shown above connected several PCB Boards together.

This part was an internal piece within a GPS device. This part was soldered into the board and connected several PCB Boards together.

There was **no finishing** on this casting, as it was an internal part of the assembly that was not visible and therefore not required.

#### Challenges:

- 1) The main challenge in this part was flatness. At such a small size and with such thin wall sections, being able to maintain the flatness of this casting was critical, as it had to maintain contact with the board across all points.

#### “Mini” Advantage

*Miniature die castings are ideal for high volume, smaller parts because the process utilizes machines that operate at significantly higher cycle rates that conventional die casting.*



### Automotive: Signal Light Heat Sink

The “ribs” on this casting are used as a heat sink for the final assembly. The rear signal light of a Ford Mustang mounts to the other side of this casting. The bulbs within the assembly generated a great deal of heat, which is ultimately tempered by the heat sink “fins”.

**Finishing:** This part was cast, de-gated, and has a black e-coat finish. E-Coat provides an economical, extremely thin coating for corrosion protection and cosmetic appearance.

#### Challenges:

- 1) One of the biggest challenges with this miniature die casting was the flatness on the recessed surface of the other side of the casting, opposite the heat sink.
- 2) Another challenge was controlling flash in the complex shut-offs and pockets.



### Medical: Anesthesia Machine Regulator Knob

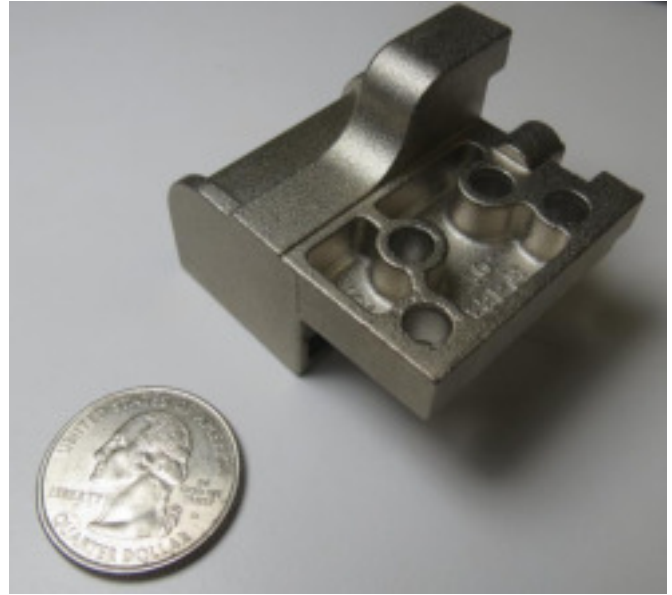
An anesthesia machine provides a controlled, continuous supply of anesthesia medication to a patient when it is necessary to induce unconsciousness. The miniature die casting shown above is the Adjustable Pressure Limiting (APL) valve knob, which replaced a previous plastic version. This knob is used in manual (or spontaneous) adjustment of ventilation.

The customer felt that for such an expensive machine, the switch to a metal knob would reflect a valuable purchase more than a plastic knob.

**Finishing:** This part was cast, de-gated, machined, coated, painted, and pad printed with lettering.

#### Challenges:

- 1) Because the pad print is normally executed atop a flat, horizontal surface, the knob's angled base proved to be a challenge when pad printing. There was the potential of pad printing with elongated numbers and letters, or misplaced printed features.



### Electronics: PCB Board Component

This miniature die casting goes into the same PCB assembly as the previously mentioned PCB Board parts.

**Finishing:** This part was cast, machined and aluminum oxide blasted. This aluminum oxide blast finish is used for an improved cosmetic look.

#### Challenges:

- 1) The biggest challenge with this casting was designing a gating system that would fill the part efficiently. With 5 actions required to cast the complex geometry, finding a place to inject the metal was difficult.

#### “Mini” Advantage

Zinc alloys are typically used in a miniature die casting as they allow parts to be cast with thin walls, without compromising hardness and durability. Another “zinc” benefit is a lower melting point (in comparison to other casting metals) – this saves on energy and prolongs the life of the tool.



### Digital Projection: High End Projector Component

Digital projection can be seen on the walls of Disney World, in the amazing light display at the Olympics opening ceremony, and at various types of light shows, from nightclubs in Vegas to Stone Mountain projections in Georgia.

This part was cast and machined – there were **no surface finishes** on this casting.

#### Challenges:

- 1) There was an adjoining part that connects to this piece and should fit perfectly against the curved portion. The challenge was creating the curve with minimal vestige and flash.

#### “Mini” Advantage

*Miniature zinc die castings can accept virtually any finish, whether decorative or functional. Zinc alloys have a tendency to not only surpass most die casting metals in strength, but their properties allow for a more cohesive bond with a surface finish.*



### Bar Code Scanning: Handheld Scanner Component

A handheld scanner is used to scan barcodes easily in order to keep track of inventory, for retail store pricing, packaging, and other commercial applications. This miniature zinc die casting is a part of a handheld scanner assembly.

**Finishing:** This part was cast, de-gated, and black chromated and sealed. The black chromate finish was used to prevent corrosion.

#### Challenges:

- 1) The square openings and interior ribs have very thin wall sections. Creating an effective, flash-free gating system was crucial to the success of this project.



### Medical: Pharmaceutical Door Latch

In order to keep pharmaceuticals well-secured, an electronic security system is needed to store drugs and prescription medications. One of these systems required a door latch designed to strict specifications.

**Finishing:** This part was cast, de-gated, blasted, and machined. The blasting assisted with flash removal.

#### Challenges:

- 1) The “arm” was a critical piece to this casting; the biggest issue was filling the arm, due to the peculiar shape of the protrusion.
- 2) The entire latch mini die casting needed to be flash-free.
- 3) The requirements called for zero draft.
- 4) Another requirement was to minimize the visibility of the parting line as much as possible.

With these challenges, CWM was able to overcome the obstacles and create a part that worked beautifully for the customer.

## CONCLUSION

*For mini zinc die cast parts, be sure to involve a die casting engineer as early as possible in the design process. This will allow for prototyping and pre-testing to ensure the fit, form, and function meet the requirements of your application.*

*Early involvement with a die casting engineer can help you and your team better understand the die casting process, which will ultimately result in components that are more accurate and less costly to produce.*

*Having as many project and design options available is also important. Keep in mind that this project is a vital part of a larger supply chain as well as an investment of resources and capital. The importance of quality, price, accuracy, and timeline directly correlate with all other steps in the production process.*

*Once all aspects of tool and part design have been considered, both you and your die caster can decide which method of production suits your project needs.*