

Phillips Plastics Corporation®

# INTERFACE

## Our World Is Micro Sized

Our world is micro sized at Phillips Plastics Corporation®, where our team of engineers, toolmakers, and production people are trained to think tiny. As true micro molders, we specialize in manufacturing plastic, metal, and ceramic components of microscopic scale – ranging from 0.000008 to 0.003 cubic inches, with the ability to hold tolerances as little as  $\pm 0.0003$  inches.

### Total Solutions

As your one-stop shop for micro molded components, Phillips Plastics is able to perform complete device manufacturing within our dedicated, secure area with full-scale operations. We also provide total solutions from design through distribution, as well as access to our strategic global assembly and manufacturing partners that share our commitment to technology, quality, confidentiality, value, and service.

### How Minute is Micro?

**Maximum Size:**

0.150" x 0.150" x 0.150"

3.81 mm x 3.81 mm x 3.81 mm

**Minimum Size:**

0.020" x 0.020" x 0.020"

(or smaller, depending on your application)

0.5 mm x 0.5 mm x 0.5 mm

Phillips Plastics makes injection molded plastic, metal, and ceramic components that compare to the size of a pinhead.



## Maximum Benefits

### Expertise

We offer a unique blend of complete in-house services, highly trained technical engineers, and years of injection molding experience.

### Higher material usage, low material waste

Our proprietary process yields a larger percentage of finished part versus runner, as compared to conventional molding.

### Reduced tooling cost

Program investment is typically several times lower than conventional injection mold tooling. In most cases, prototype tooling can also be used for production, with no additional investment required if the final product design does not change.

### High cavity-to-cavity repeatability

Our process maintains precision tolerances to support the most demanding applications. Depending on part geometry, tolerance can be held at  $\pm 0.0003$  inches.

### Reduced lead time

Time to market is significantly less than conventional molding. Lead time for initial samples is typically three to five weeks, depending on complexity of part, tolerances, geometry, design, and specific requirements.

### Clean room molding

Micro molding is housed in a Class 100,000 clean room facility, which is a critical requirement for manufacturing micro-sized parts. The clean room facility is part of our Phillips Medical facility that is certified in ISO 9001:2000, ISO 13485:2003, ISO 14001:2004, FDA-21CFR Part 820, FDA-21 CFR Part 210/211, State of Wisconsin Pharmacy License (Manufacturing).

### Multi-cavity tooling capability

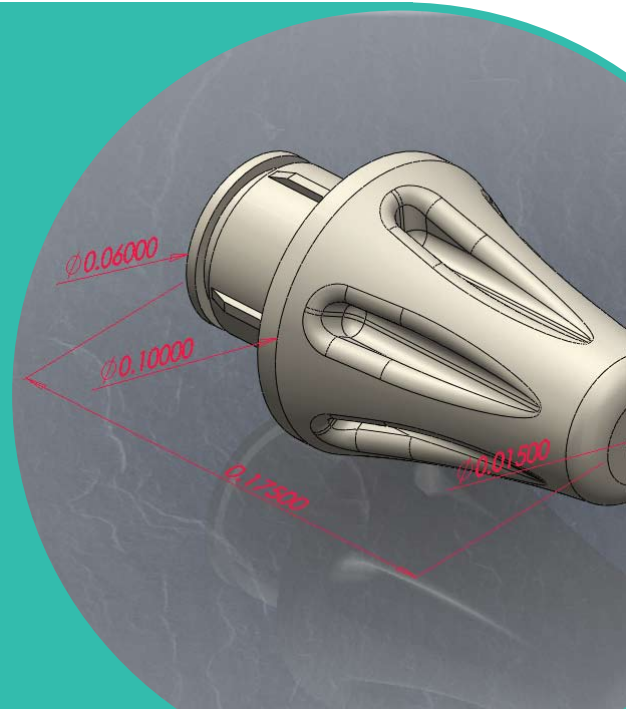
Available to customers with programs that require more than two million parts annually. Multi-cavity tooling may also be used to reduce overall part price.

## Micro Molding Tooling

As part geometries become smaller in scale, Phillips Plastics blends state-of-the-art equipment and early involvement to keep tool pricing as low as possible.

### Phillips Plastics Tooling Capabilities:

- Wire EDM: 0.002" - 0.010" diameter
- Steel-to-steel EDM: 0.0150" diameter M2 pins
- Sinker EDM 0.0134" diameter to a depth of 0.075" (greater than 5:1 depth to diameter ratio)
- Micro tool construction to  $\pm 0.0002$ " (5 Microns)
- Telescope 0.0134" diameter pin into a matching hole, forming a steel/steel crossover shutoff
- Wire EDM technology using a 5th axis for spin wiring part detail
- Hard machine detail using 0.004", 0.1mm-end mills in 54Rc tool steel
- Gate diameters down to 0.006"



## Electronics Micro Molding

### One-Stop Shop Increases Speed to Market

With multiple Phillips Plastics facilities already developing components for an MP3 player, Phillips Plastics' micro molding capabilities were the perfect solution for an electronics customer looking for a one-stop shop for their program. To begin, the team at Phillips Plastics created prototype tools to produce two different parts for the MP3 player's earpiece. Even with the demanding specifications for the part, including very small detail areas consisting of long, deep ribs with thin cross sections and part details requiring a complex mold design, the Phillips Plastics team was able to build tools and have samples to the customer for approval in less than five weeks.

A Phillips Plastics project engineer says, "While five weeks may be a moderate lead time for prototype tooling, micro-molding technology allows prototype tooling to transfer directly into production if no part design changes are required, significantly reducing lead time to market. With conventional molding, you would have to go back and retool for production. This would increase costs and extend lead times."

### Full-Service Capabilities

- In-house design services including material evaluation, analysis, and testing
- Complete in-house, proprietary tooling services
- Market-entry parts in as little as two to four weeks, depending on complexity
- Prototype quantities and low volume production to several million pieces annually
- Annual production volumes from thousands or hundreds of millions of parts
- All conventionally tooled parameters available
- Depending on part geometry, tolerances can be held at  $\pm 0.0003$  inches
- In-mold capabilities including undercuts, threads, thin wall sections to 0.002" dependent on component size and gate location
- Engineering grade plastic resins and materials, including implantables and micro electro-mechanical systems (MEMS)
- Metal materials available, including: 420, 316, and 17-4 stainless steel; 4605 iron nickel, and CP4 titanium
- Ceramic materials, including Catamold AO-F, AO-H, TZP-A, ZTA-FB, and custom blends
- Full range of value-added secondary services, including assembly, packaging, sterilization, coatings, platings, insert molding, and clean room



## Medical Micro Molding

### Achieves High Tolerances, Low Cost

Looking to produce a medical fastener for use during surgery, a large medical customer came to Phillips Plastics for help in creating their part with a demanding tolerance of  $\pm 0.0005$  inches. According to a Phillips tool maker, "With conventional molding and multiple cavity tooling, cavity-to-cavity and process variability would already push us out of part tolerance. With our micro molding technology, we felt confident we could hit the tolerances required for this part."

In addition, with the volumes requested and high cost of the materials, the micro molding process made it possible for Phillips Plastics to offer a low-cost solution to the customer. "With our process, we don't have to worry about part-to-part repeatability. We were able to produce a process with high shot-to-shot repeatability as well as high material usage. Both of these variables significantly reduced the cost for the customer," explains Phillips Plastics' tool maker.

### Common Markets for Micro Molding Applications

Aerospace	Micromechanics
Automotive	Military
Computer	Optics
Electronic	Sensors
GF-Transmission	Telecommunication
Medical	Watches



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# Phillips

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