

Basic MIM Design Guide

As a leader in metal injection molding for the last 20 years, we know a thing or two about the design process. Our quick guide walks you through design recommendations, typical attributes and material properties. Still stumped? Let our experts take a closer look. Call us at (814) 342-5898.

Design Do's

- Maintain uniform wall thickness
- Core out thick areas
- Design with a flat surface, lettering and threads
- Consider location of gates, ejector pins, and parting lines.

Design Dont's

- Walls should be no thinner than 0.1mm (0.0039 in.)
- Don't design holes smaller than 0.1mm (0.0009 in) in diameter
- Dont design components over 12.55 mm (0.5 in.) thick and over 100 grams in mass
- Avoid designing sharp corners

Typical Attributes Produced by the MIM Process

| Attribute | Minimum | Typical | Maximum |
|-------------------------|-------------------|------------|-------------|
| Component Mass (g) | 0.030 | 10-15 | 300 |
| Max Dimension (mm) | 2.0 (0.08 in) | 25 (1 in) | 150 (6 in) |
| Min Wall Thickness (mm) | 0.025 (0.001 in)* | 5 (0.2 in) | 15 (0.6 in) |
| Tolerance (%) | 0.2% | 0.5% | 1% |
| Density | 93% | 98% | 100% |
| Production Quantity | 1000 | 100,000 | 100,000,000 |

*Features this small could have distortion.

MIM Structural Material Properties

| Material | Density (g/cc) | YS (MPa) | UTS (MPa) | Elongation (%) | Unnotched Charpy Impact Energy (J) | Macro Hardness | Young's modulus (GPa) |
|----------------|----------------|----------|-----------|----------------|------------------------------------|----------------|-----------------------|
| 316L SS | 7.8 | 180 | 520 | 40 | 190 | 67 HRB | 185 |
| 17-4PH SS | 7.6 | 740 | 900 | 6 | 140 | 27 HRC | 190 |
| 17-4PH SS H900 | 7.6 | 1100 | 1200 | 4 | 140 | 33 HRC | 190 |
| 420 SS | 7.5 | 1200 | 1370 | | 40 | 44 HRC | 190 |
| 440C SS | 7.6 | 1600 | 1250 | 1 | | 55 HRC | 190 |
| 310 SS | 7.5 | | | | | | 185 |
| Fe | 7.6 | | | 20 | | | 190 |
| 2200 (2 Ni) | 7.6 | 125 | 280 | 35 | 135 | 45 HRB | 190 |
| 2700 (7.5 Ni) | 7.6 | 250 | 400 | 12 | 175 | 69 HRB | 190 |
| 4605 | 7.55 | 210 | 440 | 15 | 70 | 62 HRB | 200 |
| 4605 HT | 7.55 | 1480 | 1650 | 1 | 55 | 48 HRC | 210 |
| 4140 HT | 7.5 | 1200 | 1600 | 5 | 75 | 46 HRC | 200 |

ISO 9001 | ISO 13485

Fig. 1 Illustration of thickness transition recommendations.

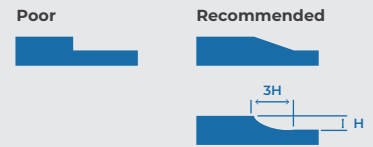


Fig. 1.2 Illustration of inside & outside draft angle to allow easy component removal from tool.

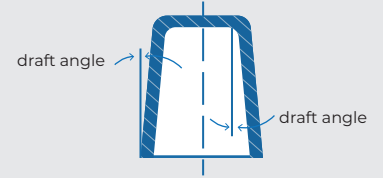


Fig. 1.3 Illustration of good and poor practice in wall thickness.

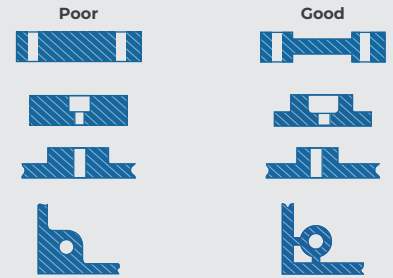


Fig. 1.4 Comparison of two drafted inside diameters with an undrafted inside diameter.



Fig. 1.5 Thread of configuration with a flat to prevent flash from interfering with thread operation.

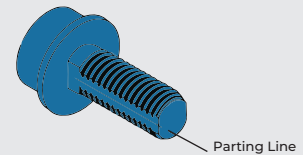


Fig. 1.6 Comparison between good and poor practice in rib design thickness. Notice the oversized rib will cause a sink to form.

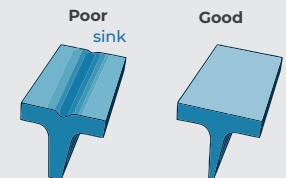


Fig. 1.7 Design considerations for radii for MIM processing.

