ADVANCED POWDER PRODUCTS, INC.

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 (0.0039 in.) in diameter
- Don't design components over 12.5 mm (0.5) 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 (0a.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

Further Information: Handbook of metal injection molding, ed. D. Heaney, ISBN: 978 0 85709 066 9.

ISO 9001 | ISO 13485

Fig. 1 Illustration of thickness transition recommendations.

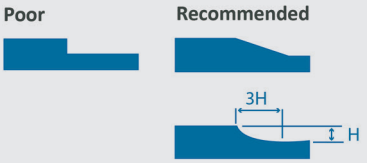

Fig. 1.2 Illustration of inside & outside draft angle to allow easy component removal from tool.

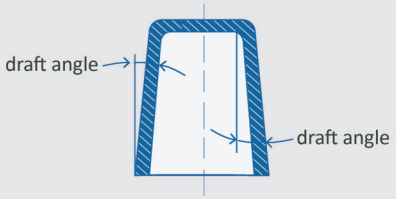

Fig. 1.3 Illustration of good and poor practice in wall thickness.

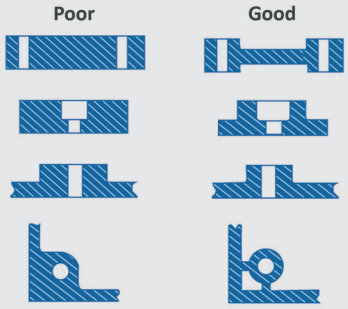

Fig. 1.4 Comparison of two drafted inside diameters with an undrafted inside diameter.

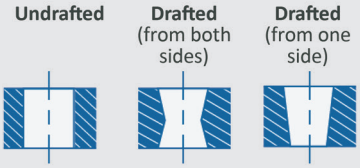

Fig. 1.5 Thread of configuration with a flat to prevent flash from interfering with thread operation.

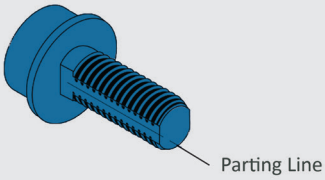

Fig. 1.6 Comparison between good and poor practice in rib design thickness. Notice the oversized rib will cause a sink to form.

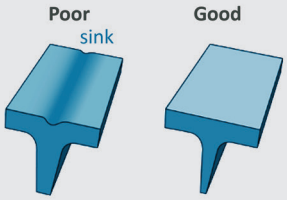

Fig. 1.7 Design considerations for radii for MIM processing.