### PROCESS MATRIX - DSB POWDER METALLURGY

	ATTRIBUTE	PRESS & SINTER	CONVENTIONAL MIM	3DM™ MIM	ADDITIVE BINDER JETTING (MBJ)
	VOLUME (EAU)	30,000-Millions	20,000-Millions	20,000-Millions	1-100,000
	PART SIZE	≤ 2268g (± 5-lbs or less)	0.5-50g (± 2-oz or less)	10−450g (± 1-lb)	≤ 11,340g (± 25 lbs)
	SHAPE & FORMABILITY	Uni-axial Compaction	Multi-axial Material  Deposit  (Compare with ≥ 3 CNC Setups)	Multi-axial +Threads/Knurls (Part or Component Consolidation; Compare with ≥ 3 CNC Setups)	No Constraints ( ≥ 4 CNC Setups and/or non- toolable features)
	SURFACE FINISH	1.6 um punch surfaces 0.8 um die wall surfaces * In line with MPIF Standard 58	50-80 μin	100-140 μin	150 μin
1	TOLERANCE	± 0.1-0.15%	± 0.3%	± 0.5%	± 1.0%
	DRAFT	Not Required Can be included to assist with off-tooling; will not appear on part	Required Only for Features w/ High Aspect Ratio(s)		
	COMMON MATERIALS  Custom Alloys Available	Ferritic SS Austenitic SS Duplex SS Martensitic SS Soft Mag. Alloy	300-SS Series 400-SS Series Tool Steels - M2, 4140 Soft Mag. Alloy Non-Ferrous Alloys	300-SS Series 400-SS Series Tool Steels - M2, 4140 Soft Mag. Alloy Non-Ferrous Alloys	<ul> <li>17-4 PH SS</li> <li>316L SS</li> <li>M2 Steel</li> <li>4140 Steel</li> </ul>
	PROPERTIES	PM MPIF Standard 35	MIM MPIF Standard 35		
	TOOLING (Equipment required to prepare the part: Dies, molds, punches, etc.)	\$3,000-\$60,000	\$30,000-\$80,000	\$30,000-\$80,000	\$0 / NA
	SECONDARY OPERATIONS	Post-sintered powder metal parts behave similar to bar stock and can—if required—be:  Machined, Turned, Coined, Milled, Drilled, Ground, Heat-treated, Plated, Coated.			
	AVG. LEAD TIME (Off-Tool Samples)	± 12-14 Weeks	± 18 Weeks	± 18 Weeks	2-4 Weeks

The information provided in this document is based on current industry standards and averages, and should not be used as a formal cost estimate. Information is subject to change without notice.







# シ膚 MFG-RELATED ATTRIBUTES

# **COST-RELATED ATTRIBUTES**







Part-forming equipment required to

DLING

\$30,000-\$80,000

\$3,000-\$60,000

\$30,000-\$80,000

\$0 / NA

prepare the

part (i.e, dies, molds,

punches, etc.)





AVERAGE PART SIZE

Weight/Size may vary based on

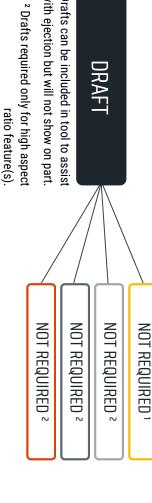
≤ 10-450g

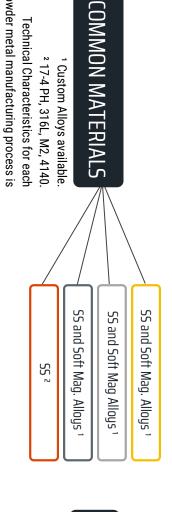
≤ 11,340g

≤ 0.5-50g

≤ 2268g

design features.





SHAPE & FORMABILITY

<sup>2</sup> Alternate to ≥3 CNC setups and/or

threads/knurls

<sup>1</sup> Opportunity for component or

Multi-axial Material Deposit

No Contraints <sup>3</sup>

Multi-axial Material Deposit 1

**Uni-axial Compaction** 

assembly consolidation.

3 Alternate for ≥4 CNC setups or

non-toolable features

0.8-1.6 µm surfaces¹

50-80 µin

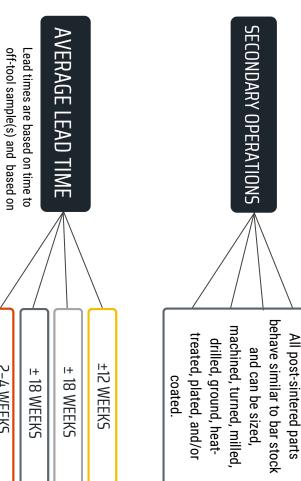
**SURFACE FINISH** 

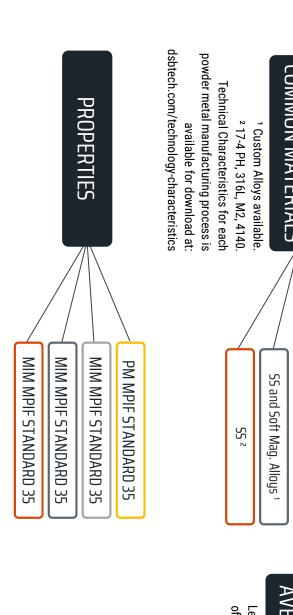
10.8 µm die wall; 1.6 µm punch face

100-140 µin

150 µin

\* In line with MPIF Standard





## project Scope of Work (SOW) **PROCESS KEY** 2-4 WEEKS

### DISCLAIMER: INFORMATION ACCURACY

notice. subject to change without and averages, and should not current industry standards this document is based on be The information provided in estimate. Information is used as a formal cost

PM PRESS & SINTER **≤** 

3DM™ MIM

**METAL BINDER JETTING**