PROCESS MATRIX – DSB POWDER METALLURGY

	ATTRIBUTE	PRESS & SINTER	CONVENTIONAL MIM	3DM™ MIM	ADDITIVE BINDER JETTING (MBJ)
PART-RELATED	**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
MFG-RELATED	**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	• 17-4 PH SS • 316L SS • M2 Steel • 4140 Steel
	PROPERTIES	PM MPIF Standard 35	MIM MPIF Standard 35		
COST-RELATED	**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.

PART-RELATED ATTRIBUTES

VOLUME (EAU)
- 30,000–MILLIONS
- 20,000–MILLIONS
- 20,000–MILLIONS
- PROTOTYPE–100,000

AVERAGE PART SIZE

Weight/Size may vary based on design features.

- ≤ 2268g
- ≤ 0.5–50g
- ≤ 10–450g
- ≤ 11,340g

SHAPE & FORMABILITY

[1] Opportunity for component or assembly consolidation.
[2] Alternate to ≥3 CNC setups and/or threads/knurls
[3] Alternate for ≥4 CNC setups or non-toolable features

- Uni-axial Compaction
- Multi-axial Material Deposit [1]
- Multi-axial Material Deposit [2]
- No Contraints [3]

SURFACE FINISH

[1] 0.8 µm die wall; 1.6 µm punch face
* In line with MPIF Standard

- 0.8–1.6 µm surfaces[1]
- 50–80 µin
- 100–140 µin
- 150 µin

MFG-RELATED ATTRIBUTES

TOLERANCE

[1] Tooling-controlled dimensions at approx. 0.035mm/inch. Tolerance subject to part length.

- ± 0.1–0.15% [1]
- ± 0.3%
- ±0.5%
- ± 1.0%

DRAFT

[1] Drafts can be included in tool to assist with ejection but will not show on part.

[2] Drafts required only for high aspect ratio feature(s).

- NOT REQUIRED [1]
- NOT REQUIRED [2]
- NOT REQUIRED [2]
- NOT REQUIRED [2]

COMMON MATERIALS

[1] Custom Alloys available.
[2] 17-4 PH, 316L, M2, 4140.
Technical Characteristics for each powder metal manufacturing process is available for download at: dsbtech.com/technology-characteristics

- SS and Soft Mag. Alloys [1]
- SS and Soft Mag Alloys [1]
- SS and Soft Mag. Alloys [1]
- SS [2]

PROPERTIES

- PM MPIF STANDARD 35
- MIM MPIF STANDARD 35
- MIM MPIF STANDARD 35
- MIM MPIF STANDARD 35

COST-RELATED ATTRIBUTES

TOOLING

Part-forming equipment required to prepare the part (i.e, dies, molds, punches, etc.)

- $3,000–$60,000
- $30,000–$80,000
- $30,000–$80,000
- $0 / NA

SECONDARY OPERATIONS

- All post-sintered parts behave similar to bar stock and can be sized, machined, turned, milled, drilled, ground, heat-treated, plated, and/or coated.

AVERAGE LEAD TIME

Lead times are based on time to off-tool sample(s) and based on project Scope of Work (SOW)

- ±12 WEEKS
- ± 18 WEEKS
- ± 18 WEEKS
- 2–4 WEEKS

INFORMATION ACCURACY DISCLAIMER:
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PROCESS KEY

- PM PRESS & SINTER
- MIM
- 3DM™ MIM
- METAL BINDER JETTING