

ADDITIVE MIM · PRINTING GEOMETRY, SINTERING METAL

Additive freedom for metal parts in series production

Complex parts and variants without a dedicated injection mould – with a sintering process chain that can be scaled for series production.



Where A-MIM can make a difference

If an MIM mould doesn't pay for itself, variants change frequently, or complex geometries require extensive machining, a comparison is worthwhile.

Technology, economics and implementation with FIT

01 / WHY A-MIM?

Printed geometry, sintered metal

A-MIM combines additive shaping with a sintering process chain. This opens up a manufacturing route between tool-bound MIM and direct metal-melting processes.

	MIM	A-MIM	LPBF
Geometry	Injection moulding in a mould	Layer-by-layer build-up with binder	Layer-by-layer melting with laser
Metallic densification	In the sintering furnace	In the sintering furnace	During printing
Variants	Often requires mould changes	CAD change; process re-evaluated	CAD change; build process re-evaluated
Pay special attention to	Tooling costs and demoldability	Shrinkage, support bed and build volume use	Supports, build time and residual stresses

MIM: Metal Injection Molding. LPBF: Laser Powder Bed Fusion, often referred to as laser melting.

Concrete figures for initial screening

250–50,000 parts per year as a review range; up to around 100 mm per dimension as an initial size guide. Quantities, volumes and weights follow on the next two pages.

Where the difference becomes economically relevant

Compared with MIM, the part-specific injection mould is no longer needed. Compared with LPBF, shaping and metallic densification are separated; printer and furnace capacity can be planned for series production. A cost advantage only arises when utilisation, sintering behaviour and post-processing all align.

Is A-MIM worth considering for your part?

An existing design is enough for an initial orientation. A brief assessment can be provided free of charge; the scope and cost of further work is clarified before we begin. **To the part check →**

PLANNING / QUANTITIES

Reviewing 250 to 50,000 parts per year

This range is the focus of FIT's A-MIM application concepts. It describes a review range, not a fixed economic threshold.

Annual requirement	When a review is worthwhile
Under 250 parts	Prototypes, spare parts or particularly complex, high-value components. Development and process costs must pay off even at small quantities.
250-5,000 parts	Grippers, locking mechanisms, brackets and other complex functional parts. Variants and avoided assembly steps can be the deciding factor.
5,000-50,000 parts	Recurring series and part families, such as special nozzles or compact valve bodies. Printer and furnace capacity as well as post-processing become especially important.
Over 50,000 parts	Not technically excluded. For an identical, easily injection-mouldable design, classic MIM should be calculated especially carefully as an alternative.

Quantity per variant makes a difference

20 × 500

20 variants with 500 parts each

1 × 10,000

One design with 10,000 parts

Both add up to 10,000 parts a year. With tool-bound processes, 20 variants can require additional moulds or mould inserts. A-MIM does not need these injection moulds; changes may still require a new process design.

State annual quantity and batch size separately

An annual requirement of 10,000 parts can, for example, be delivered in ten batches of 1,000 units. The economic production quantity also depends on capacity utilisation, set-up effort and delivery dates.

Source: FIT / ClickToFit, A-MIM practical examples, accessed 21 October 2026. The ranges are intended to help select review candidates; they do not imply a minimum order quantity or a price commitment.

PLANNING / SIZE, VOLUME AND WEIGHT

How big can the part be?

As an initial design guide, dimensions up to around **100 mm per axis** apply. Larger parts are possible but require a targeted assessment of handling and sintering behaviour.^[1]

Outer dimensions are not metal volume

A part measuring 50 × 40 × 30 mm occupies an enclosing box of 60 cm³. If its geometry is only a quarter metal, the metal volume is 15 cm³ – roughly 120 g for stainless steel.

Metal volume and weight: concrete orders of magnitude

Metal volume	Weight at 8 g/cm ³	Edge length of an equally sized solid cube
1 cm ³	approx. 8 g	10 mm
5 cm ³	approx. 40 g	17 mm
10 cm ³	approx. 80 g	22 mm
25 cm ³	approx. 200 g	29 mm
50 cm ³	approx. 400 g	37 mm
100 cm ³	approx. 800 g	46 mm

Calculation examples for the sintered state, not approved manufacturing limits. The rounded density of 8 g/cm³ is for estimation purposes; material and residual porosity affect the actual weight.

Why the printer's build volume is not a part approval

Example HP Metal Jet S100: **430 × 309 × 170 mm** effective build volume per the manufacturer.^[2] This holds the larger, still unsintered parts including the necessary spacing. At an example 20% linear shrinkage, a target dimension of 100 mm requires a print dimension of 125 mm.

Outer dimensions of 100 × 100 × 100 mm mean 1,000 cm³ for a solid body, or roughly 8 kg of stainless steel. The size guide therefore does not imply suitability for such a solid body. Wall thickness, mass distribution and the sintering support also play a role.

[1] AMPOWER Insights Vol. 8 (2021), p. 19: general design guidance for sinter-based processes; not a FIT delivery limit.

[2] HP Metal Jet product page, S100 configuration, accessed 21 October 2026. Machine specification depends on configuration.

02 / TECHNOLOGY

Printed first, then sintered: how the metal part is made.

A-MIM combines additive shaping with debinding and sintering. A part-specific injection mould is not required.

1 Printing the green part

Metal powder and binder are built up layer by layer into the desired shape. The still-unsintered green part is mechanically sensitive.

2 Removing the binder

During debinding, the binder is removed. The process can work thermally, with solvent, or catalytically. The porous intermediate state requires careful handling.

3 Sintering and densifying

Below the melting temperature, the metal particles bond together. Pores become smaller; the part densifies and shrinks.

4 Finishing and inspection

Functional surfaces receive their final dimensions and finish where required. The agreed characteristics are checked.

Different routes to the green part

Binder Jetting: A print head deposits binder into a metal powder bed. **Cold Metal Fusion:** A laser melts the polymer content of a composite powder. **Material Extrusion:** Metal powder and binder are deposited track by track as filament or pellets.

Material and properties are project-specific.

Availability, density, surface finish, wall thickness and tolerances depend on the material, process and process control. Which materials FIT can offer for your part is clarified based on your specific requirements.

03 / DESIGN & SINTERING

Designing the raw part. Thinking sintering through.

The design influences how a part behaves during sintering and how much post-processing is needed afterwards.

Thinking sintering through

Considering geometry and support together.



Schematic illustration.



Integrating functions

Channels, ribs, connectors and mounts can be combined within the raw part. This can reduce joints and assembly effort.

Distributing mass sensibly

Abrupt transitions between solid sections and thin walls can promote uneven shrinkage and distortion.

Defining the support

The part loses dimensional stability at sintering temperature. A suitable sintering support – the setter – can support it and must allow for shrinkage.

Compensating for shrinkage

Print dimensions, orientation and, where necessary, local corrections are matched to the material, process and part.

Calculation example: 125 mm becomes 100 mm.

Assuming 20% linear shrinkage: $\text{print dimension} = \text{target dimension} / 0.80$. This is a calculation example, not a general scaling factor. Actual shrinkage can vary by direction.

Illustration: part on a shape-matched sintering support.

04 / MECHANICAL POST-PROCESSING

Functional surfaces: precision where it's needed.

The raw part carries the complex shape. Function determines which surfaces are additionally machined.

Only functional surfaces need precision



Feature	Typical task after sintering
Fitting bores and bearing seats	Bring to the agreed fit dimension.
Threads	Cut or rework threads.
Sealing surfaces	Achieve the required flatness and roughness.
Reference and contact surfaces	Secure installation position, movement or stop.

Non-critical outer surfaces, ribs and other contours can remain in the as-sintered state, provided they meet requirements. Machining allowances and tool access are planned early.

Post-processing can be economical too.

A complex raw part can save on material removal and clamping setups despite further machining. What matters is the entire production chain through to the installation-ready part.

05 / ECONOMICS

From what quantity does A-MIM pay off?

The answer results from one-off costs, cost per good part and demand over the entire programme life – including all variants.

Cost driver	What belongs in the comparison
One-off costs	For MIM and conventional investment casting: injection moulds. For A-MIM: process design, sintering supports and possible development iterations. For CNC and LPBF: programming, fixtures or build preparation.
Quantity and variants	Tooling costs are spread across identical parts. Variants can require additional moulds. A-MIM avoids these moulds; a new variant can still trigger development effort.
Production per part	Material, machine and furnace time, capacity utilisation and handling. For CNC, material removal and clamping setups come into play; for LPBF, among other things, build height and support effort.
Finishing	Heat treatment, mechanical processing, surface finishing, assembly as well as agreed inspections and documentation.
Yield and delivery demand	Scrap, rework, batch sizes and repeat orders. What matters is the cost per acceptable part.

Comparison formula

Cost per good part = allocated one-off costs + production + post-processing + inspection and assembly + allocated scrap and rework costs.

What information makes the comparison reliable?

Geometry and material, annual and batch quantity, number of variants, critical tolerances, inspection requirements and delivery demand. Together we assess the installation-ready condition.

A-MIM is not a generally cheaper process. It can become economical when avoided tooling, material or assembly costs outweigh the effort of the sintering process chain.

06 / APPLICATION CONCEPTS

Application examples with potential for A-MIM

Four tasks where geometry, quantity and scope of supply should be considered together.



Simplifying assemblies

Combining connections and fasteners in one manifold. Fewer individual parts can reduce assembly and joints; sealing surfaces and inspections still need to be clarified.



Using material purposefully

Ribs and pockets instead of unnecessary solid material. Load capacity, sintering behaviour and machining access determine the design.



Mechanical functional parts

Producing complex levers and locking parts close to net shape. Bores, contact surfaces and wear requirements are specifically considered.



Variants and spare parts

Using common interfaces for different versions. Changes to the base body can require a new sintering design.

Shared geometry can reduce effort.

Similar wall thicknesses, supports and mass distributions make it easier to transfer manufacturing experience to variants. Transferability is verified on the specific part.

Illustrative application concepts, not documented FIT customer references.

Working together towards the right design

Your requirements and our manufacturing know-how form the basis for the next step.



SERVICE 01

Checking suitability together

You know the function and operating conditions. Our manufacturing experts assess geometry, material target and quantity with you, along with possible risks in printing, sintering and post-processing.

Your result: An assessment of suitability, open points and a recommended next step.



SERVICE 02

Assessing economics

Together we compare the entire production chain. Your quantities, variants and delivery needs form the basis; suitable alternative processes are included.

Your result: A decision basis with assumptions; a concrete quotation once requirements are clarified.



SERVICE 03

Developing the design

Our designers recommend changes, revise existing geometries, or develop a design from your functional description. You help decide on changes to functions and interfaces.

Your result: An agreed design for the defined development stage.

Clarifying scope and cost before starting

We offer in-depth review, design, development and production, quoted before work begins. Not every project needs every step.

From sample to agreed delivery

Together we define which results your project needs for the next decision.



SERVICE 04

Demonstrating manufacturability

Our experts design the manufacturing approach and produce initial samples. Together we assess the results against the previously agreed criteria.

Your result: Real samples and an assessment of the agreed manufacturability targets.



SERVICE 05

Implementing production

We combine printing, sintering, post-processing and agreed inspections. We align delivery condition, version and quantity with you.

Your result: The agreed parts or assemblies with the defined documentation.



SERVICE 06

Realising variants

For variants and spare parts we clarify requirements together. Our experts check which designs and process experience can be carried over.

Your result: A manufacturing solution with clearly described requirements and changes.

Is a sample project the next step?

Is the goal clear? Are material and critical functions described? Does manufacturability still need to be tested in practice? Then we define the sample scope together. Further verification can be agreed separately.

08 / GETTING STARTED WITH DEVELOPMENT

Testing manufacturability together on a sample

Development with first samples from €5,000

The offer includes an agreed development and sample scope to test manufacturability.



The result: samples and a technical assessment

We produce initial samples and assess the agreed manufacturability targets. The results form the basis for your next project decision.

Part, material target, sample scope and evaluation criteria are defined together before we begin. Whether the entry price fits the task is clarified based on requirements. The scope and price in the quotation are binding.

A complete functional or lifetime test and series qualification are not generally included. These services are agreed separately if required.

09 / SCOPE OF SUPPLY

Manufactured as far as you need.

FIT can supply as-sintered parts, fully machined components or assembled units – matched to the project.

**01 / RAW PART****As-sintered part**

The agreed raw-part condition as the starting point for your further processing.

02 / COMPONENT**Fully machined**

With agreed fits, threads, sealing surfaces and further machining.

03 / ASSEMBLY**Assembled**

With the agreed additional components and assembly services.

The delivery condition is defined in advance.

A clear agreement includes version and quantity, critical characteristics, inspections and documentation. This defines which work FIT carries out and which steps follow on your side.

A production quotation can also be the next step directly.

If the design and requirements are sufficiently clarified, not every project needs to start with its own development phase.

10 / THE NEXT STEP

Want to try A-MIM? Here's how.

The joint review starts with an existing design or a specific task.

1 Submitting the part or task

Upload CAD data in the part check. Send drawings or tasks without a finished design by email.

2 Getting an initial orientation

We clarify with you whether A-MIM is fundamentally an option and which information is still needed for a reliable assessment.

3 Agreeing the next step

Together we define the service, result and cost. In-depth work begins on the basis of the agreed scope.

PART CHECK

Start with your part

Scan the QR code or open the link:

clicktofit.com/a-mim/bauteilcheck/



Alternatively, contact the FIT team directly:

contact@fit.technology · FIT AG, Lupburg

Useful information includes quantity, material requirements, critical functions and timing needs. A brief orientation can be provided free of charge; an in-depth assessment may be chargeable depending on the effort involved. We clarify this before starting.

Basis: clicktofit.com/a-mim/ and the FIT service description. Process comparison additionally based on HP "Metal Jet technology", technical description: hp.com/go/metaljet. As of: October 2026.

Part images: illustrative application concepts, not documented FIT customer references. Technical possibilities, services and scope of supply are to be agreed on a project basis. The quotation is binding.