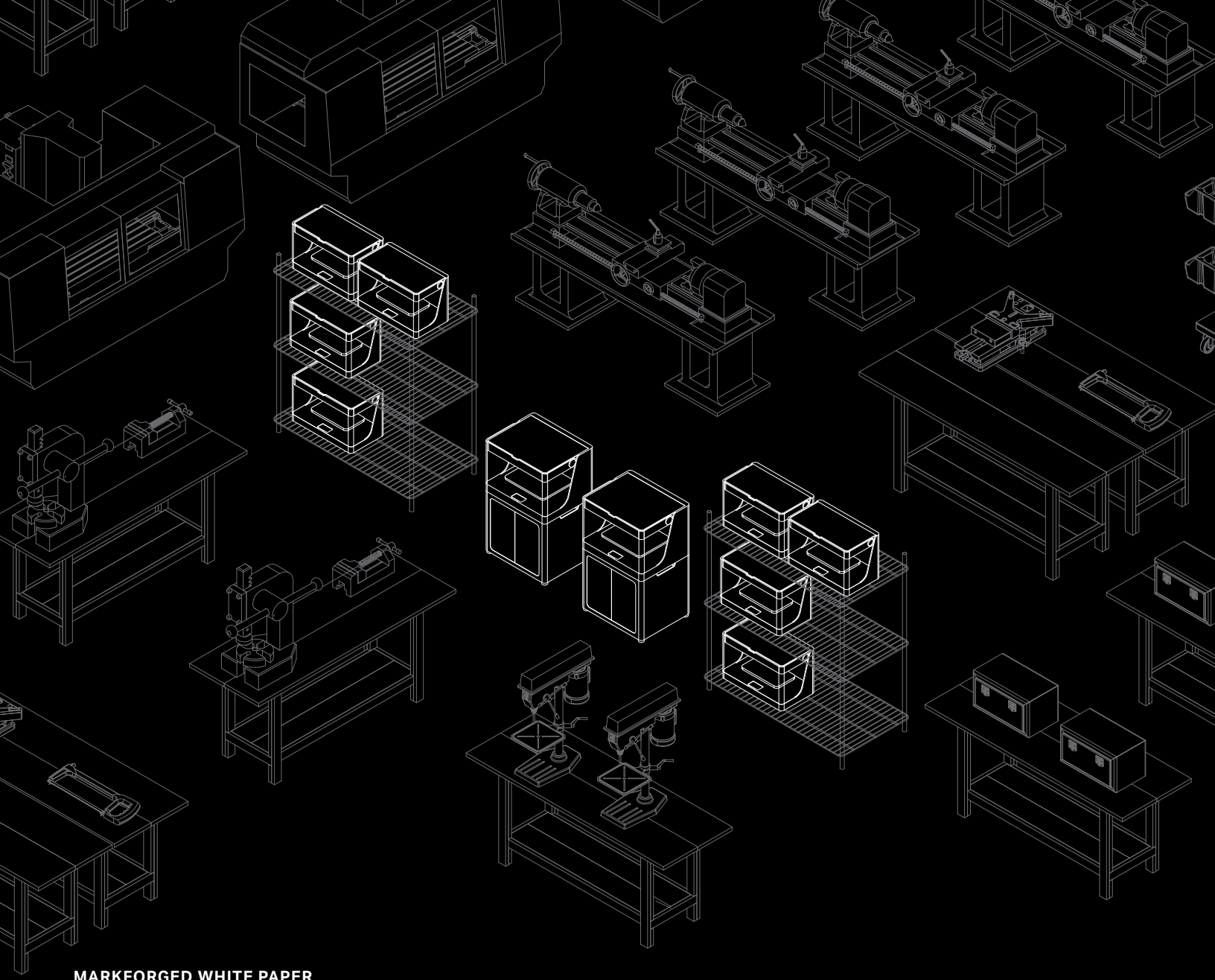

MARKFORGED WHITE PAPER

3D PRINTED TOOLING & FIXTURES

Additive manufacturing is not only useful as a production method for end use parts, but also as a complement to other manufacturing methods in the machine shop. Industrial 3D printers produce high-strength parts tough enough to withstand manufacturing floor environments, where printed parts are put to use as tools, jigs, and fixtures. This paper shows how you can reduce costs and optimize production floor uptime by highlighting practical 3D printing use cases in everyday manufacturing operations.

Authorized Reseller

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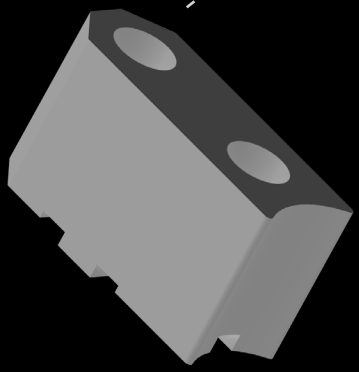
Markforged

MARKFORGED APPLICATION SPOTLIGHT

LATHE BORING SOFT JAWS

Boring precise holes in non-concentric parts conventionally is a painful process. Not with Markforged parts. With our machines, you can easily design and print precise soft jaws that hold your part concentrically for boring and other turning processes.

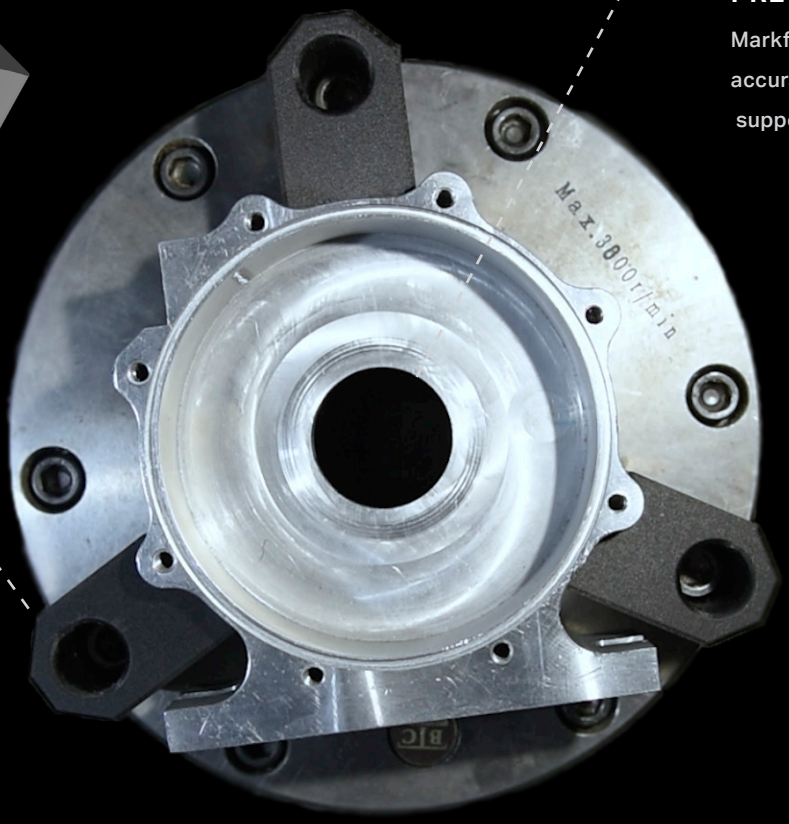


EASY DESIGN

Each jaw starts as a pre-designed blank, so all you need to do is insert and subtract your part.

PRECISE BORING

Markforged printed jaws are accurate and stiff enough to support precise boring operations.



CUSTOM FIT

Custom geometries in the jaws allow the lathe to hold non-concentric geometries.

	Calibration Time	Machining Time	Cost
Bored on Mill	High	None	$$
Bored with 4 Jaw Chucks	Very High	None	$$$
Machined Soft Jaws	None	High	$$$
Markforged Soft Jaws	**None**	**None**	**$**

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INSPECTION FIXTURES

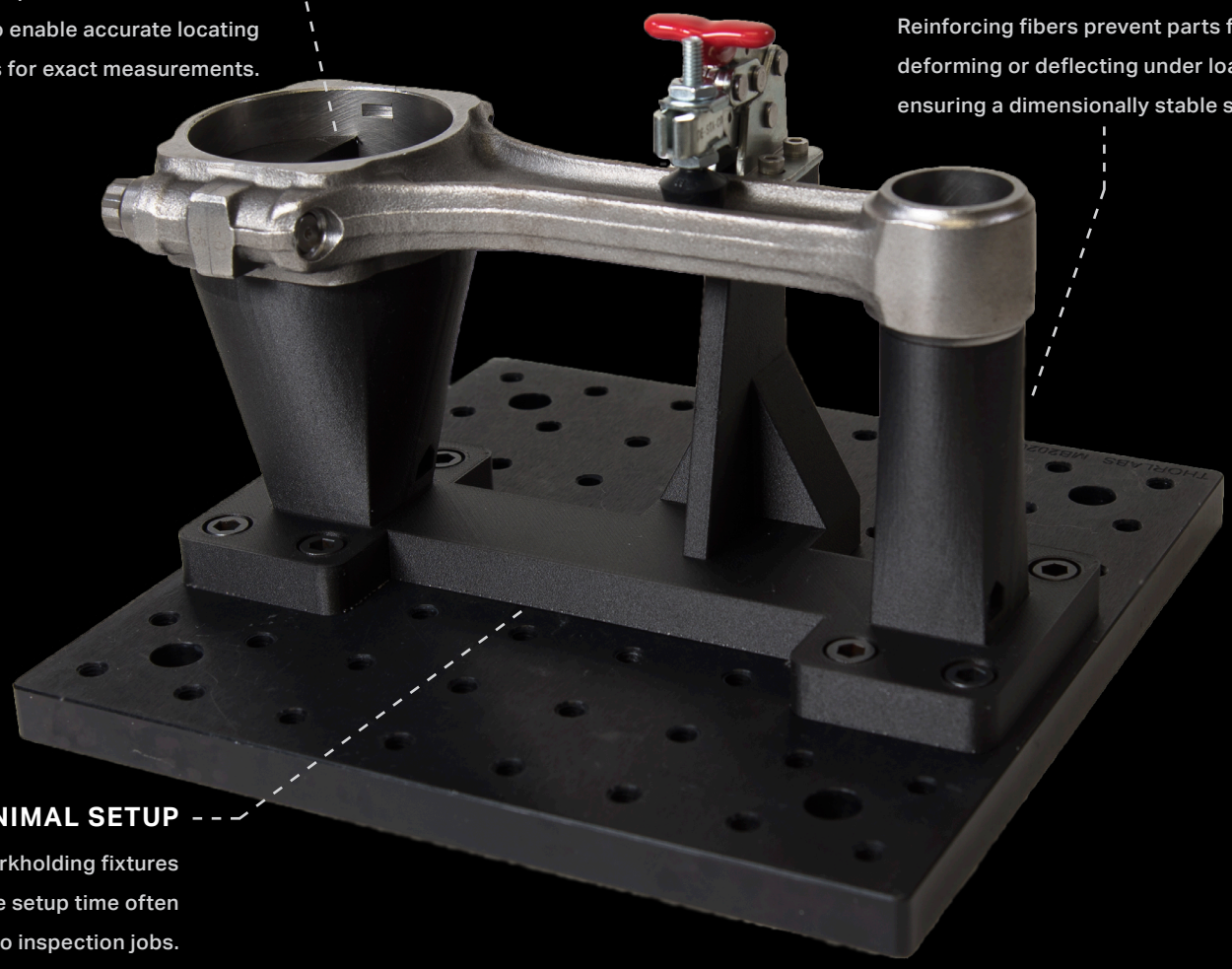
Quality assurance is often reserved for high volume and highly precise manufactured products due to the time and cost investment associated with inspection setups. Certify more parts in less time with cost effective, standalone fixtures printed with Markforged composite 3D printers.

PRECISION ALIGNMENT

Markforged printers offer 50 micron precision to enable accurate locating features for exact measurements.

ROBUST CONSTRUCTION

Reinforcing fibers prevent parts from deforming or deflecting under load, ensuring a dimensionally stable setup.



MINIMAL SETUP

Standalone workholding fixtures eliminate the setup time often inherent to inspection jobs.

	Setup Time	Machining Time	Cost
Generic Fixturing Tools	High	None	$$
Custom Machined Fixtures	None	Very High	$$$
Markforged Fixtures	**None**	**None**	**$**

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MARKFORGED APPLICATION SPOTLIGHT

WELDING SUPPORTS & JIGS

Welding jobs often have high associated setup time due to generic and multi-purpose fixturing tools that may not be suitable for challenging structural geometries. Using Markforged composite 3D printers, you can design and print specialized alignment jigs, custom mounts, and fixtures that can drastically reduce setup time and improve the precision of welding operations.

INTEGRATED HARDWARE

Inserted welding rests isolate heat to prevent heat damage to the print. Threaded inserts provide mount points for clamps.

HEAT DEFLECTION

With a heat deflection of 145° C, printed risers and fixtures are suitable for TIG or MIG welding.

ALIGNMENT JIGS

Print alignment tools to ensure your parts are precisely oriented before you weld.

	Setup Time	Machining Time	Cost
Generic Risers	Very High	None	$$
Custom Machined Risers	None	Very High	$$$
Markforged Risers	**None**	**None**	**$**

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MANUFACTURING REINVENTED

From custom soft jaws for difficult machining operations to alignment jigs for welding, An industrial 3D printer can improve many of the behind-the-scenes tasks associated with manufacturing and fabrication. Complement your manufacturing floor with a Markforged printer and experience shorter lead times, increased machine bandwidth, and reduced manufacturing costs.

At Markforged, we are on a mission to unlock the next 10x innovation in design and manufacturing. We build an Industrial 3D Printing Platform to liberate designers and engineers from decades-old, slow processes. NASA, Google, Ford, Amazon, General Electric and thousands of companies in 50 countries use Markforged to print same-day prototypes and produce stronger end-use parts than they did before. With Markforged, they're able to ship 50x faster, spend 20x less, and build 23x stronger products.

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