

# Metal Binder Jetting

## From detailed features to massive structures

The partnership between GKN Additive (Forecast 3D) and HP has led to the industrialization of binder additive manufacturing (AM) for serial production. The binder jetting 3D-printing process for metal parts yields extremely high build rates, with a scaling potential that harnesses GKN Powder Metallurgy's longtime experience in the sintering of high-performance metal parts and products for mass production, dating back to when its first sinter metal plant opened in Bonn, Germany, in the 1930s.

## Benefits

- Most effective metal AM process
- Very high build rates up to 2,000 ccm/h
- Technology build for serial production: more than 1,000 parts/year (no maximum limit)
- High variety of metals and high-performance alloys available
- Complex designs with higher-resolution details than laser AM or investment casting
- Minimum wall thickness: >0.5mm
- Sustainable production due to reusable powder feedstock

## Applications

- General industrial and media distribution (e.g., fluid manifolds, nozzles, filters)
- Automotive parts
- Toolmaking (such as press tools and cutter)
- Consumer products and wearables (for example, watch casings)



This cut-open distribution element for gaseous media, made with 316L material, reflects how Metal Binder Jetting can create complex structures that are not possible to produce using nonadditive technologies.

## Process

1. GKN Additive (Forecast 3D) reviews the order file to evaluate and align on customer requirements.
2. Project technicians review the customer's CAD files to ensure data integrity and part printability/de-powder and sinter, providing feedback for potential improvements.
3. Once aligned and approved on the order objective, the customer receives an order confirmation. Our team works with the customer to develop a step-by-step project schedule and ship date.
4. Printing involves two major steps: 1) spreading powder (the recoater applies a thin layer of powder in the working area), and 2) thousands of nozzles in the print heads precisely place binding agent droplets selectively on the print area. The process repeats until the parts are finished.
5. Curing: The binding agent is cured to increase strength in the green part for safer handling.
6. De-powdering: Loose powder is removed from the surfaces of the part and can be recycled.
7. Sintering: The green parts are sintered in a furnace.
8. Finishing: The parts may undergo machining and surface treatment that is common for solid steel parts. If necessary, the sintered parts can be post-processed to the requested finishing level.
9. Our quality assurance team reviews parts for official sign-off and release to customer. Quality checks consider automotive standards and can be adapted to individual customer requirements.

Dimensional tolerance	ISO tolerance class 14 (sintered part Cpk 1.33)
Wall thickness	0.5–30 mm
Surface quality	Ra 6, Rz 45 µm
Part size	Recommended maximum green part size: ~100 x 100 max. 80 mm
Build volume	X440 Y309 Z200 mm
Resolution	XY 1200DPI (21 µm) Z50-100 µm

## Materials

**316L.** Universal austenitic stainless steel with high corrosion resistance for automotive, industrial, consumer, and medical applications

**17-4PH.** Stainless steel with high strength and hardness for automotive, industrial, and tooling applications

**FSLA (free sintering low-alloy material).** DP600-like dual-phase steel for crash-/impact-critical structural applications in automotive and other industries

**Ni-free stainless steel.** High-strength stainless steel for nickel-sensitive applications for the consumer and medical industries

**Pure Cu & CuCrZr (in development).** For electrical engineering and heat transport applications

**M2 tool steel.** High-speed steel with up to 64 HRC hardness for industrial and tooling applications



This complex static mix element shows geometries based on static mixers. Note the inner cavities in the blades and the ring channel, which can be produced reproducibly in large quantities using binder jetting technology.

**Find out how GKN Additive (Forecast 3D) can take your product from prototype to production. Visit [forecast3d.com](https://forecast3d.com) today or contact us directly at (877) 835-6170 or [hello@forecast3d.com](mailto:hello@forecast3d.com) to learn more.**