

Beyond the extraordinary: 3D printed jewelry and fashion accessories

Legor, Italian specialist in precious metals science, makes high quality Platinum objects with 3D metal binder jet technology





Customer
Legor Group S.p.A

Location
Bressanvido, Italy

Industries
Jewelry & luxury
Fashion & decorative

Machines
Production System™ P-1 for platinum

InnoventX™ for silver, bronze,
stainless steel, and gold (in R&D stage)

Sample applications
Watch cases
Rings

Website
www.legor.com

Specialist in precious metals science

Legor is a multinational group founded in Italy in 1979 specializing in transforming metals into high-quality master alloys, powders, and galvanic solutions tailored for the production of jewelry and high-end accessories.

By providing high-performance master alloys and electroplating solutions for jewelry and fashion accessory manufacturers, Legor enables its customers to transform their creative visions into tangible masterpieces. These solutions ensure optimal compatibility with a wide range of metals, facilitate efficient in-house production and enhance the aesthetic and functional properties of the final products.

Committed to quality, the environment, and operational safety, Legor's daily operations strive to provide the best quality while protecting the health and safety of its employees, safeguarding the environment, and ensuring that its activities meet the needs of the communities in which it operates.

Printing service with 3D metal binder jet technology

Legor believes that 3D printing is a more sustainable alternative to traditional investment casting as it does not require the burning of waxes or resins, nor the use of gypsum. Legor also believes that for certain applications, printing with 3D metal binder jet technology is a better alternative to laser powder bed fusion (L-PBF) and metal injection molding (MIM). By 3D printing a design direct from a digital file, 3D metal binder jet technology eliminates the need for hard tooling in the MIM process, making the manufacturing process more agile and faster.

Compared to the micro-welding L-PBF process, binder jetting eliminates the need for support structures during printing because there is no thermal stress involved in the process. This allows parts to be efficiently stacked to maximize the entire build area, and without supports, printed parts require less post-processing while minimizing material waste.

In addition, binder jetting is particularly well-suited for large-scale production in addition to prototyping. Its efficiency and scalability position it as a leading choice for production-level additive manufacturing.

Drawing on its forty-five years of experience in the luxury goods industry, Legor decided to establish Legor 3D Metal Hub in 2022, a research and development center dedicated to the experimentation and production of precious and non-precious components using revolutionary metal binder jetting technology, including from Desktop Metal.

“We introduced this technology in our facility to understand how the process works. We also developed specific powders because we really believe that 3D printing will be one of the next manufacturing technologies” said Fabio Di Falco, Legor’s Marketing and Customer Support Manager.

With expertise in both additive manufacturing and powder production, the company decided to offer binder jet printing services to the luxury goods industry through the 3D Metal Hub. This advanced solution enables Legor to produce of semi-finished products and near-net-shape objects.

“By providing 3D printing services, we hope to accelerate the market adoption of metal binder jetting technology,” said Di Falco. Moreover, Legor believes that the luxury and fashion goods market needs to be properly educated about the benefits of 3D metal binder jet technology. “Since we are still at the beginning of the adoption curve, we need to educate the industry about the benefits of metal binder jetting. The industry is really tied to its heritage of traditional manufacturing – that’s another reason why we created the 3D Metal Hub. We invite our customers to visit the Hub so they can see, touch, and feel the excellent results of metal binder jetting firsthand,” added Di Falco.

Despite having only a few employees, the 3D Metal Hub is able to operate efficiently and print products in large quantities thanks to metal binder jetting technology.

A **semi-finished product** is an item that requires additional processing before it is considered a finished product. For example, a solitaire ring that needs to be polished, finished and set with a stone.

The term **near-net-shape** refers to the dimensional tolerances achievable through the technological production process. It means that the printed object is already very close to its final shape, requiring only minor adjustments rather than extensive mechanical machining. This capability reflects the technology’s ability to produce objects that are highly accurate in terms of dimensions compared to the digital file received.

3D metal binder jet technology fulfills the distinct needs of the jewelry & fashion industries

Legor points out that the jewelry and fashion sectors have specific needs that are very difficult to meet. “The jewelry and fashion industries have high demands and are extremely critical in terms of quality. Creativity, exclusivity, and perfection are very important to them,” said Di Falco.

The company believes that 3D metal binder jet technology is the answer for these demanding customers. “Agility, creativity and sustainability are the three main drivers behind Legor’s adoption of metal binder jetting. They also describe the best advantages of the technology,” Di Falco said.

Agility

Legor points out that 3D metal binder jet technology allows the company to be very agile, which means offering fast delivery times, speed to market, and quick sampling or rapid prototyping.

“The concept of fast fashion has been really common in recent years. With 3D metal binder jet technology, we don’t need any kind of support, stamp, which takes about a month or two to produce and is also very expensive. This means we can provide fast answers and semi-finished products to the entire supply chain. We can save time and a lot of money,” explained Di Falco.

The whole process from sampling to delivery of the results is really fast at Legor. The entire process takes less than a week, with the printing step taking only one day. “In three to five working days we can deliver the first batch or the first sample, from one to 100 pieces or thousands of pieces, depending on the dimensions,” said Di Falco.

Using 3D metal binder jet technology, Legor is able to reduce component assemblies and print several different geometries at the same time, layering them efficiently within a single build. Di Falco pointed out: “The technology

reduces the need for assembly. It also means we can produce different objects in a single print cycle. We can produce limited editions, both small and large runs. We can remain cost-effective, even in low volumes, and offer competitive prices. We can also save costs in the production of complex parts.”

Creativity

Legor believes that 3D metal binder jet technology has opened doors not only for production managers, but for designers in particular. Designers are starting to understand how the technology can completely change their usual design perspective and allow them to think outside the box.

“Since metal binder jet is based only on 3D models or designs and not on molds, designers are now able to create something really exclusive, creative,



and completely different,” said Di Falco. “Especially objects that cannot be produced with the most common technologies, such as casting, CNC, or mold stamping. This is a real benefit to stand out, especially for designers, because nowadays the market is really full of objects and designs.”

Moreover, metal binder jetting allows Legor to produce intricate geometries, much to the delight of its customers. As Di Falco pointed out: “Now our customers know that we can produce complex geometries and exclusive designs. With the Desktop Metal binder jet system, we can create hollow or interlocking pieces without the need for soldering, which leads to many other benefits.” The benefits are as follows:

- Improved design flexibility: 3D metal binder jet technology allows for more intricate and complex geometries that would be difficult or impossible to achieve with traditional soldering methods.
- Enhanced structural integrity: Without solder joints, the final pieces are more uniform and less prone to weak points, ensuring greater durability and strength.
- Time and cost efficiency: Eliminating soldering reduces production time and labor costs, making the process more streamlined and economical.
- Aesthetic improvements: By avoiding soldering, there are no visible seams or joints, resulting in a smoother, cleaner finish.
- Environmental benefits: The process reduces the need for additional materials such as solder or flux, which can be wasteful or harmful to the environment.

Overall, Legor argues that 3D metal binder jet technology enhances both the functional and visual quality of parts while optimizing production efficiency.

Another benefit of using metal binder jetting in Legor’s production is the ability to produce lightweight products. Di Falco explained how that results in both production savings and performance improvements for users: “From an industrial point of view, lightweight products are more convenient because less material is used. From the end user’s perspective, taking a watch case as an example, they have a lighter watch on their wrist. The perceived value is higher. It is a win-win solution for both parties.”

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Fabio di Falco, Marketing and Customer Support Manager, Legor



The technology also allows Legor to produce lattice structures and other designs commonly used in other industries, such as automotive and aerospace, for the jewelry and fashion industries. Finally, the metal binder jetting technology enables Legor to offer mass customization and design personalization.

As Di Falco pointed out: “With just one 3D design from our customer, we are able to personalize a product and easily produce the customized pieces with metal binder jetting, avoiding additional post processing like laser.”

Sustainability

Metal binder jetting also enables Legor to manufacture efficiently and meet the sustainability demands of the jewelry and fashion industries. “In any casting process, there is a lot of water consumption and pollution, gypsum and burning of some substances. Technologies like CNC usually produce a lot of waste cutting down to the desired shape. With binder jetting, we don’t have scrap and waste. We are able to recover 100 % of the powder from green scrap parts, reducing material waste and associated costs. We can reuse 99 % of the powder. So metal binder jetting is more sustainable than other manufacturing processes,” Di Falco argued.



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Legor was accepted as a member of the Responsible Jewellery Council (RJC) in 2011. The company has been a certified RJC member since 2013, demonstrating its commitment to contributing to sustainable development.



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In February 2021, Legor was awarded the RJC Chain of Custody (CoC), a voluntary certification for RJC members that gives its customers and suppliers the assurance they need about how Legor’s precious metals have been sourced, tracked and processed through the supply chain.

Today, Legor is one of the few companies able to certify that its products are made exclusively with precious metals sourced from 100 % recycled sources, with a fully documented chain of custody.

Binder jetting can process a wide range of materials

Since 2023, Legor has observed an increasing trend in interest of stainless steel as a material. As sustainable production has received more attention than ever before, manufacturers have started to move away from bronze and other less sustainable materials. However, stainless steel is typically very difficult to process using conventional technologies. But with revolutionary 3D metal binder jet technology, stainless steel and many other materials, including precious metals, can be easily processed.

Desktop Metal 3D metal binder jet technology has revolutionized the processing of platinum

Legor pointed out that one of the biggest challenges in the jewelry industry is precious metals such as platinum and its unique properties. Platinum melts at very high temperatures (around 1,900 °C/3,452 °F), requiring special and more expensive tools compared to standard crucibles and plugs. In addition, it dissipates heat poorly when processed, causing standard tools to deteriorate rapidly. This forces manufacturers to use more durable but more expensive tools, significantly increasing processing costs.

Di Falco explained: “Processing platinum has traditionally been very difficult and laborious. It is a really tough material to work with, to machine, and to customize. It is also not so easy to find raw materials. CNC makes a lot of scrap, which is not good for precious metals. In the end, you have to refine the materials to recover those precious metal scraps and refining platinum is a very expensive and complex process.”



Legor showcased binder-jetted semi-finished products, including this platinum watch case and rings, at Formnext 2024 in Frankfurt, Germany.

Despite the challenges of processing platinum, Legor believes that the introduction of 3D metal binder jet technology to the world of high-end jewelry and watchmaking has revolutionized the workflow, overcoming many of the challenges associated with its fabrication.

Mattia Lago, 3D Metal Hub Operations Manager at Legor, noted the potential of binder jetting production in platinum for the company from a technical point of view: “After just a few months of research and development, we saw that the objects we binder jet in platinum can have applications in both semi-finished products and near-net-shape objects. As far as semi-finished products are concerned, we manage to fill a gap in the market because there are no semi-finished products in platinum available otherwise,” he said.

Moreover, Lago also has seen other advantages in binder jetting platinum: “We can produce in a wide range of sizes, with a minimum of excess metal to allow tool uptake, thus reducing machining waste. Speaking of near-net-shape objects, since we do not melt the material for casting, rather our thermal phase is during sintering, we always work in the solid state and thus our objects are free of typical casting defects. This means that we have no shrinkage porosity and no gas porosity. Our process ensures greater adherence to mathematical models, which means we have much greater dimensional repeatability and we can also guarantee greater design freedom.”

Davide De Bonis, Key Account and Business Development Manager at Legor, highlighted the benefits of adopting binder jetting for the processing of platinum from a business perspective: “Listening to our customers, we understood that platinum could indeed be the precious metal to start with, in the development of 3D technology for high-end jewelry. The idea of being able to offer our customers a finished product, ready for subsequent processes such as polishing or setting, made us think and start with this idea. With these foundations and this awareness, we decided to embark on this journey. In any case, we knew that we would have to meet the very high quality standards of high-end jewelry in terms of density, tolerance, and surface quality. We knew that our goal had to be the highest quality.”

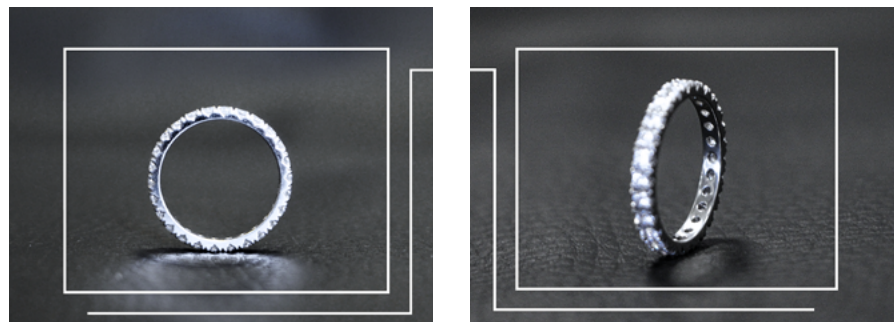
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In addition, Marketing and Customer Support Manager Di Falco emphasized the uniqueness of offering platinum products to the market: “We decided to start with platinum because those applications are rare due to the difficulty of processing it. Gold products, on the other hand, are already common because it’s a stable material and the price is always rising.”

Since semi-finished platinum products are not always available on the market due to the scarcity of raw materials, Legor decided to develop its own Platinum 950‰, a ruthenium-based, proprietary alloy powder for additive manufacturing processes.

Currently, Legor is focusing on printing platinum products specifically for the luxury watch industry, in particular by producing lightweight empty watch cases for a renowned Italian designer. “Stainless steel watches are very common. Most of the time, companies buy watch cases made with traditional technologies like MIM from lower-cost markets like China. But platinum watch cases would be completely different. As it is a heavy metal, making it lighter with binder jetting could be a real advantage for us,” explained Di Falco.

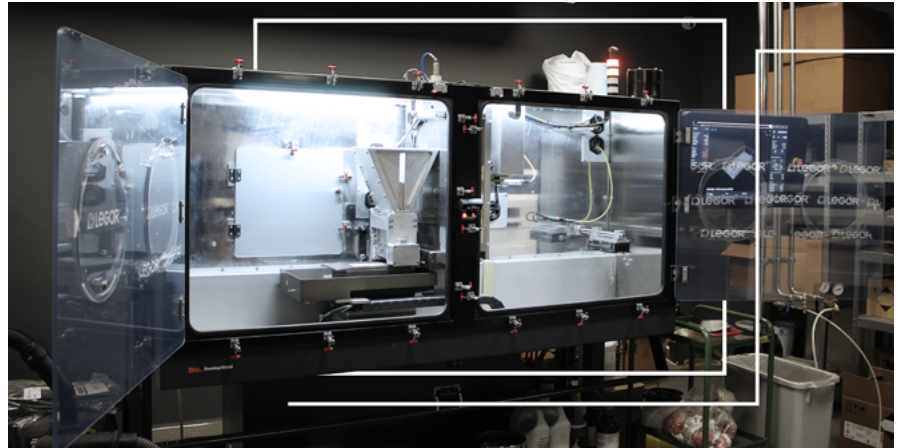


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3D printed platinum ring

Desktop Metal's Production System maximizes platinum's unique properties

Legor currently uses one of Desktop Metal's binder jetting systems, the Production System P-1, in its 3D Metal Hub. The Production System P-1 is a high-speed metal 3D printer that delivers excellent part quality, competitive cost per part, and best-in-class repeatability. The 3D Metal Hub purchased the Production System P-1 in 2023 and has since been using it intensively to produce semi-finished platinum parts.

Legor believes that the Production System P-1 is suitable for platinum processing because the printer requires only a small amount of powder to complete a job. “The P-1 only needs a minimum of 17 kg (36 lbs) of platinum powder to print. But we fill the system with 20 kg (44 lbs) of powder and we can produce well with it. That’s not so much compared to the other machine we have, which needs a minimum of 150 kg (330 lbs) of powder, which could be difficult to meet when we’re dealing with precious powders,” explained Di Falco.



Legor 3D Metal Hub uses Desktop Metal's binder jetting system, the Production System P-1, a high-speed metal 3D printer that delivers excellent part quality, competitive cost per part, and best-in-class repeatability. The system is extensively used to produce semi-finished platinum parts

Legor has also pushed the limits to increase the sintered densities of the printed platinum applications. "Our sintered densities are consistently between 99.4% and 99.6% dense. We polish the surface with some post-processing so that the quality of the products is really good in the end," informed Di Falco.

Legor's efforts seem to have paid off as its customers are pleased with the results of the company's printed platinum semi-finished products. "We're happy that the quality of our platinum products has been validated by our customers. Now we are able to achieve a quality that is comparable and sometimes even better than that of castings, with good tolerances and densities," Di Falco said.

He continued, "Printing platinum with the P-1 is real added value, especially for our watch case customer. He was impressed by the design, quality, and the lightness of the platinum watch cases. He has used the platinum cases to produce high-end luxury watches. That's a really high level, but it's like a dream come true for him," said Di Falco.

Finally, the stability of the binder jetting process is another key benefit that Legor has experienced with the Desktop Metal Production System P-1. "Casting is not always stable. Repeatability is not the strength of casting. With binder jetting, the repeatability of the results is higher," argued Di Falco.

With the aid of the Desktop Metal 3D metal binder jet technology, Legor is setting new standards in the luxury and jewelry sectors by maximizing platinum's unique properties and offering near-net-shape and semi-finished products in platinum at competitive prices.

One year after acquiring the Production System P-1, Legor decided to add another binder jetting system to its 3D Metal Hub, the InnoventX, Desktop Metal's most compact 3D printer for the production of metal, ceramic, or composite parts.

The InnoventX is the world's most researched binder jet system, known for its broad material compatibility, tight tolerances, and excellent surface finish. Operating on a basic 220V outlet, the InnoventX at Legor 3D Metal Hub is an energy-efficient system used not only for research and development purposes but also for prototyping, rapid product development, and short-run production.

“Having the InnoventX for our R&D projects is very useful because of its material flexibility. Our 3D Metal Hub has used the machine to print various silver, bronze, and stainless steel products. Besides, our R&D team will be working on a project to evaluate the feasibility of 3D printing 18-carat gold powder. And we also plan to produce our own gold powder in-house,” shared Di Falco.



Legor 3D Metal Hub also uses another Desktop Metal's binder jetting system, the InnoventX, the world's most researched binder jet system, known for its broad material compatibility, tight tolerances, and excellent surface finish.



About Legor Group

Legor Group, based in Italy, specializes in transforming metals into high-quality master alloys, powders, and galvanic solutions, tailored for the production of jewelry and fashion accessories. With a steadfast commitment to sustainable innovation, Legor ensures reliability, safety, and superior performance throughout its entire value chain and production processes. Based in Bressanvido, Vicenza, Legor has more than 200 employees, two sales offices in Italy, ten branches worldwide, and over 30 distributors.

Learn more: www.legor.com



About Desktop Metal Inc.

Desktop Metal is driving Additive Manufacturing 2.0, a new era of on-demand, digital mass production of industrial, medical, and consumer products. Our innovative 3D printers, materials, and software deliver the speed, cost, and part quality required for this transformation. We're the original inventors and world leaders of the 3D printing methods we believe will empower this shift, binder jetting and digital light processing. Today, our systems print metal, polymer, sand and other ceramics, as well as foam and recycled wood. Manufacturers use our technology worldwide to save time and money, reduce waste, increase flexibility, and produce designs that solve the world's toughest problems and enable once-impossible innovations.

Learn more about Desktop Metal and our #TeamDM brands at

www.desktopmetal.com