POWDER PRODUCT LINE

Make Easier Manufacturing, Make a Better World

BLT

Stock Code:688333.SH

Xi'an Bright Laser Technologies Co., Ltd.

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01 BLT'S PROFILE

Xi'an Bright Laser Technologies Co., Ltd.(BLT), founded in July, 2011, is an integrated solution of metal additive manufacturing supplier in China. On July 22nd, 2019, BLT was listed on the STAR Market with stock code of 688333.SH. By the end of June 2023， the number of employees is about 1480, among which R&D staff takes the percentage of 29.33%. BLT values a lot on R&D, the investment accounted for over 15% of operating income for three consecutive years. In 2020, the company was approved as the National Enterprise Technology Center and can carry out related work.

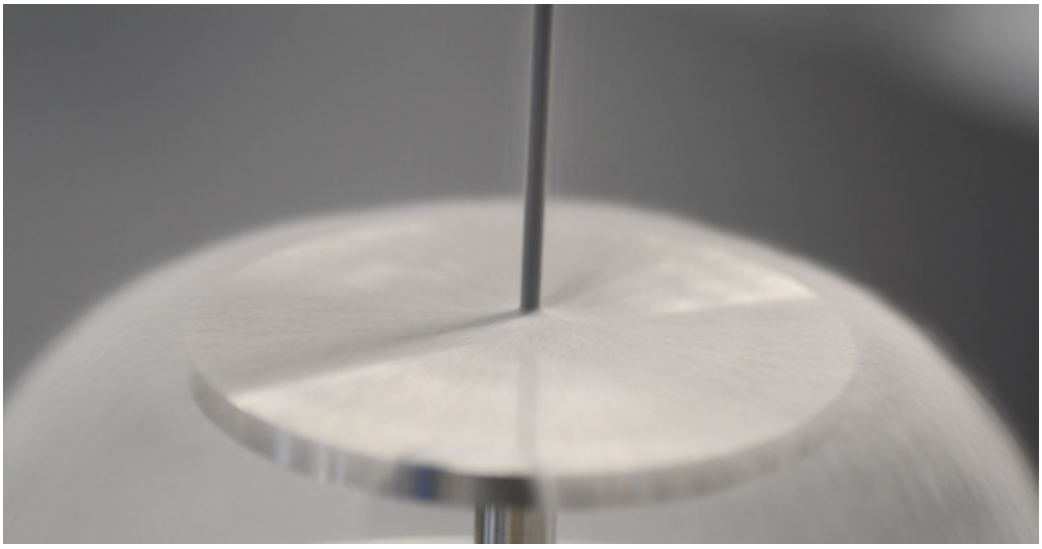
BLT can provide a complete technical solution of metal additive manufacturing for customers, including customized products, machines & systems, raw materials, software and technical service. BLT's customized metal additive manufacturing products are widely used in the fields of aerospace, medical, mold, automotive, energy, realizing lightweight structure, complex internal structure, integrated functionality,rapid prototyping, combination manufacturing, repairing and reproduction.

About
1480
Staffs

Recent three years
15%
R&D investment accounted for

Stock Code
688333.SH

02 INTRODUCTION OF POWDER PRODUCT LINE



BLT provide a variety of powder products according to different categories, grades, particle sizes. BLT powder products include Titanium and Titanium Alloys, Superalloys, Aluminum Alloys, Stainless Steel and other metal categories. The grades of powder cover more than 90% of the common metal 3D printing powder. The particle size of the powder can meet the needs of users under various different conditions. In addition, BLT has strong R&D capability which can provide users with customized services for various powder products, helping users to achieve the R&D powder trial production, printing verification and other needs.

Capacity Scale of Dedicated Workshop for Powder Manufacturing

The powder product line is equipped with a dedicated workshop covering an area of 5,000 square meters. There are 10 complete powder production lines, more than 60 sets of powder post-processing and testing machines, and the annual output of high-quality finished powder can reach 400 tons.

BLT Intelligent Manufacturing Factory for Printing Service

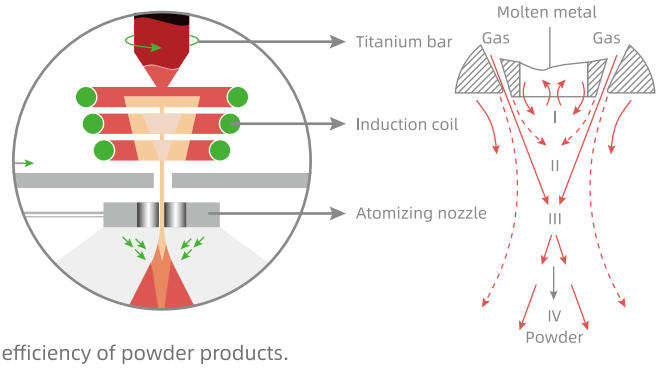
BLT Dedicated Intelligent Production Factory of Powder Lines

Powder Product

03 HIGH-QUALITY GAS ATOMIZED SPHERICAL POWDER

→ Electrode Induction Melting Gas Atomization Technology

BLT's powder production lines adopt self-developed EIGA equipment. It integrates the self-developed intelligent operating system, continuous feeding system, high-efficiency atomization system, and convenient powder collection system, which greatly improves the performance and production efficiency of powder products.



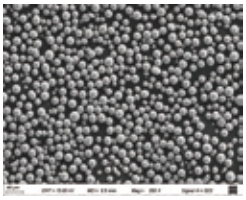
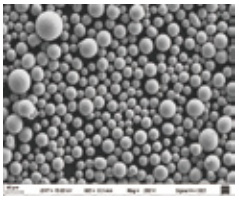
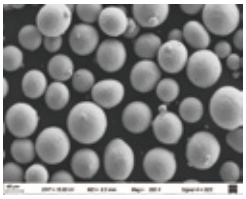
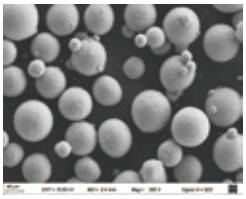
Using crucibleless electrode induction inert gas atomization technology, the powder products have characteristics of low oxygen content, high purity, high Sphercity and few satellite particles, which meets the strict requirements of additive manufacturing on powder.

→ The Core Product

Categories	Grade	Application
Titanium Alloy	Cp-Ti Grade1 Ti-6Al-4V Grade5 Ti-6Al-4V Grade23 Ti-6.5Al-1Mo-1V-2Zr Ti-6Al-2Mo-2Nb-2Zr-2Sn-1.5Cr TiAl4822 Ti_2AlNb	Aerospace/Medical/ Chemical/Electronics
Superalloy	HastelloyX Inconel 625 Inconel 718	Aerospace/Automotive/ Electronics
Aluminum Alloy	AlSi10Mg、AlSi7Mg	Aerospace/Automotive/ Chemical/Mechanical
Stainless Steel	316L、420	Mold/Industry/Aerospace
Tool Steel	18Ni300	Mold/Industry/Electronics
Cobalt-chromium Alloy	CoCrMo、 CoCrW、 CoCrMoW	Aerospace/Petrochemical industry/ Dentistry

Titanium Alloy

- **Grade:** Cp-Ti Grade1, Ti-6Al-4V Grade5, Ti-6Al-4V Grade23, Ti-6.5Al-1Mo-1V-2Zr, Ti-6Al-2Mo-2Nb-2Zr-2Sn-1.5Cr, TiAl4822/Ti-48Al-2Nb-2Cr, Ti_2AlNb/Ti-22Al-25Nb
- **Note:** Ti-6.5Al-1Mo-1V-2Zr, Ti-6Al-2Mo-2Nb-2Zr-2Sn-1.5Cr, Ti-48Al-2Nb-2Cr, Ti-22Al-25Nb are the specific components of titanium alloy product.
- **Powder properties:**
  - Good flowability
  - In accordance with GB, ASTM standard chemical composition
  - Uniform composition, high purity
- **Powder morphology:**

Grade	Cp-Ti Grade1			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤40s/50g			
Apparent Density	≥2.2g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤2000ppm			
Mechanical Properties (Annealing)	Tensile strength:400-650 MPa Yield strength:300-550 MPa Elongation:20-45%/Section shrinkage:30-75%			

Grade	Ti-6Al-4V Grade23			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤40s/50g			
Apparent Density	≥2.2g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤1300ppm			
Mechanical Properties (Annealing)	Tensile strength: 970-1030Mpa Yield strength: 880-980Mpa Elongation: 15-20% / Section shrinkage: 50-60%			

Grade	Ti-6.5Al-1Mo-1V-2Zr			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤40s/50g			
Apparent Density	≥2.2g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤1500ppm			
Mechanical Properties (Annealing)	Tensile strength: 1080-1130Mpa Yield strength: 1050-1100Mpa Elongation: 10-20% / Section shrinkage: 40-50%			

Grade	Ti-6Al-2Mo-2Nb-2Zr-2Sn-1.5Cr			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤40s/50g			
Apparent Density	≥2.2g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤1500ppm			
Mechanical Properties (Annealing)	Tensile strength:1080-1130 MPa Yield strength:950-1050 MPa Elongation:10-18%/Section shrinkage:25-40%			

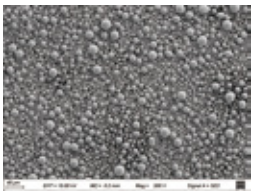
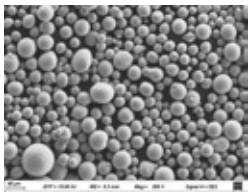
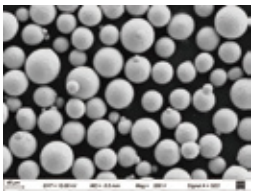
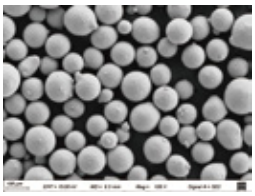
Grade	TiAl4822/Ti-48Al-2Nb-2Cr	
Product Specification	45-105μm	45-150μm

Grade	Ti_2AlNb/Ti-22Al-25Nb		
Product Specification	15-53μm	45-105μm	45-150μm

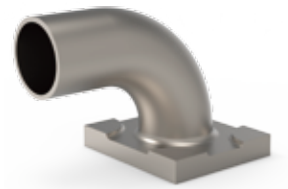
Superalloy

- **Grade:** HastelloyX, Inconel 718 NC19FeNb, Inconel 625
- **Note:** HastelloyX is similar to UNS No 6002(USA)/NC22FeD(FRA)/NiCr22FeMo(GER)/NimonicPE13(GBR)
  Inconel718 is similar to NC19FeNb(FRA)
  Inconel625 is similar to UNS No 6625(USA)/NC22DNb(FRA)
- **Powder properties:**
  - Good flowability
  - In accordance with GB, ASTM standard chemical composition
  - Uniform composition, high purity

Powder morphology:

Grade	HastelloyX			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤30s			
Apparent Density	≥4.1g/cm³			
Sphericity	≥0.8			
Oxygen Content	≤200ppm			
Mechanical Properties (Annealing)	Tensile strength:690-750MPa Yield strength:290-340 MPa Elongation:10-20%			

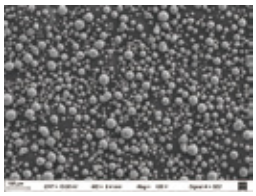
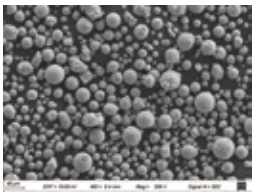


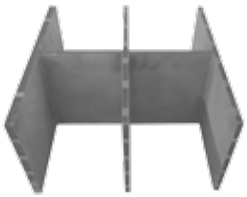
Grade	Inconel 718			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤30s			
Apparent Density	≥4.1g/cm³			
Sphericity	≥0.8			
Oxygen Content	≤200ppm			
Mechanical Properties (Annealing)	Tensile strength:1280-1450 MPa Yield strength:1030-1280 MPa Elongation:12-30%			

Grade	Inconel 625			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤30s			
Apparent Density	≥4.1g/cm³			
Sphericity	≥0.8			
Oxygen Content	≤200ppm			
Mechanical Properties (Annealing)	Tensile strength:830-910MPa Yield strength:390-480 MPa Elongation:30-60%			

Aluminum Alloy

- **Grade:** AlSi10Mg, AlSi7Mg
- **Powder properties:**
  - Good powder morphology
  - In accordance with GB, ASTM standard chemical composition
  - Uniform composition, high purity
- **Powder morphology:**



Grade	AlSi10Mg			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤80s			
Apparent Density	≥1.3g/cm³			
Sphericity	≥0.8			
Oxygen Content	≤500ppm			
Mechanical Properties (Annealing)	Tensile strength:280-340 MPa Yield strength:180-210 MPa Elongation:8-18%			

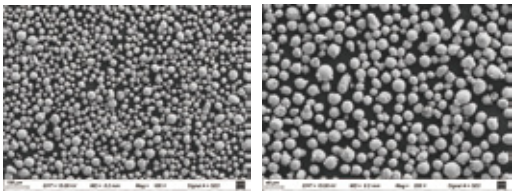
Grade	AlSi7Mg			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤80s			
Apparent Density	≥1.3g/cm³			
Sphericity	≥0.8			
Oxygen Content	≤500ppm			
Mechanical Properties (Annealing)	Tensile strength:235-270MPa Yield strength:150-170 MPa Elongation:8-14%			

Stainless Steel

- **Grade:** 316L, 420

- **Powder properties:**
  - Good powder morphology
  - In accordance with GB, ASTM standard chemical composition
  - Uniform composition, high purity

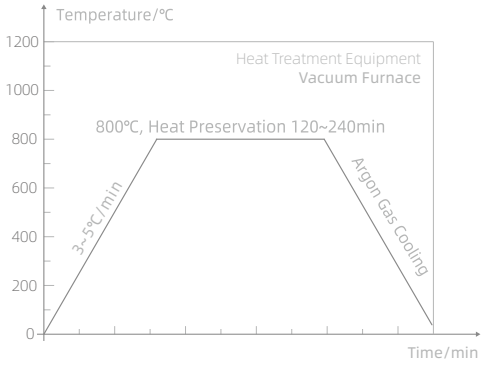
- **Powder morphology:**



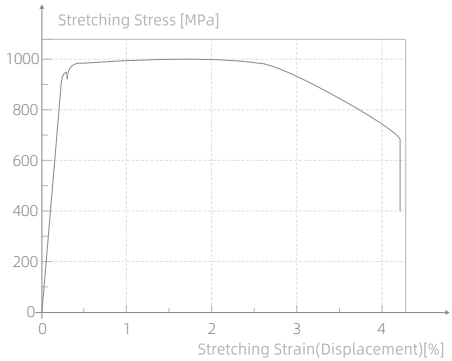
Grade	316L			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤22s			
Apparent Density	≥4.0g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤200ppm			
Mechanical Properties (Annealing)	Tensile strength:550-670 MPa Yield strength:350-400 MPa Elongation:40-65%			

Grade	420			
Product Specification	0-20μm	15-53μm	53-105μm	75-180μm
Flowability	≤22s			
Apparent Density	≥3.8g/cm³			
Sphericity	≥0.9			
Oxygen Content	≤300ppm			
Mechanical Properties (Annealing)	Hardness:50-58HRC			

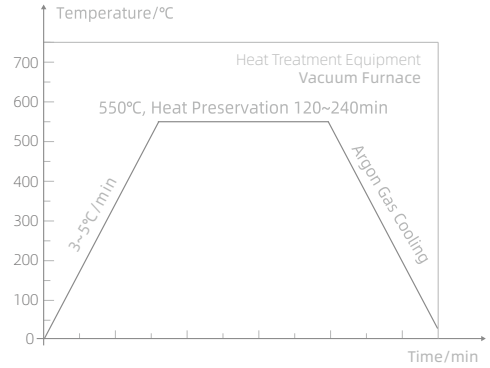
◉ **Process diagram of heat treatment curve and tensile stress-strain curve:**



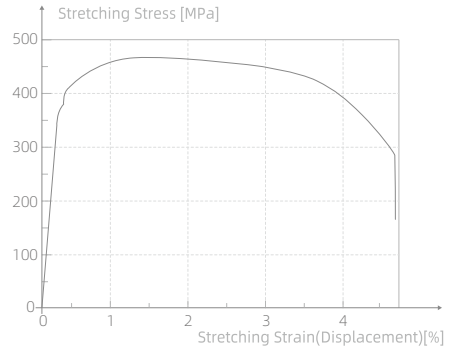
Ti-6Al-4V Grade23
Process diagram of heat treatment curve



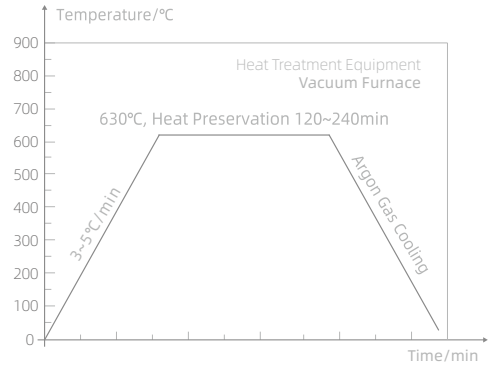
Ti-6Al-4V Grade23
Tensile stress-strain curve



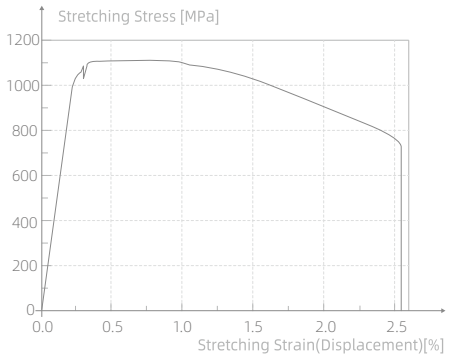
Cp-Ti Grade1
Process diagram of heat treatment curve



Cp-Ti Grade1
Tensile stress-strain curve



Ti-6.5Al-1Mo-1V-2Zr
Process diagram of heat treatment curve



Ti-6.5Al-1Mo-1V-2Zr
Tensile stress-strain curve

04 QUALITY CONTROL

The quality management system of BLT's powder products has been established and is operating effectively. The system has obtained AS9100D Aerospace Quality Management System Certification and ISO13485 Medical Device Quality Management System Certification.BLT always adhere to strict controls on raw materials, product R&D, powder production,inspection, equipment and personnel management, to ensure "Nothing Falls".

ISO13485 Medical Device Quality Management System Certification

AS9100D Aerospace Quality Management System Certification

Quality Assurance of Raw Materials:

- Selecting suppliers with reliable quality
- Strictly follow the incoming inspection procedure

Quality Assurance of Production Process:

- Formulate complete production process regulations
- Strictly following the process inspection procedure
- Training operators regularly

Quality Assurance of Finished Products:

- Standardized testing center has passed CNAS laboratory accreditation and Nadcap four certifications
- Complete regulations of inspection procedure
- Powder characteristic analysis
- Impurity detection
- Third-party testing

CNAS

Nadcap Certifications

05 APPLICATION CASES

→ Applications of Titanium Alloy

Aero-engine Fan Blade

Size: 400mm×400mm×780mm

Weight: 9kg

System: BLT-S500

Advantages:Ti-6Al-4V (USA) with the great mechanical performance meets the demand of aero engines for material performance, and its high specific strength and light weight provide support for blade weight reduction. Besides, Ti-6Al-4V has high thermal stability and oxidation resistance, which prolongs blade life and interval between inspections. Meanwhile, the interior of the parts with hollow structure, large design space, can realize the diversity of modeling to meet the needs of various scenarios.

Topological Antenna Bracket

Size: 180mm×185mm×285mm

Machine: BLT-S310

Advantages:Designed with topological optimization and integration, the weight of the antenna bracket is reduced by 35%, relieving the stress concentration state and reducing peak stress state by 6%. The internal dimension accuracy of the parts is high. High strength and medium high temperature mechanical properties of Ti-6.5Al-1Mo-1V-2Zr make the parts have high bearing capacity and stress capacity, which meets the requirements of aerospace safety.

→ Applications of Superalloy

Nickel-base Superalloy Aero Engine Crankcase

Size:Φ576mmX200mm

System:BLT-S600

Advantages: The film holes, wall thickness and other structures on the aero engine crankcase have high requirements on the forming process, and the parts manufactured with the nickel-based superalloy parameters developed by BLT can meet the high requirements of structure and quality.

Engine Integration Component

Size:Φ800mm×400mm

Weight: 567Kg (Part + Substrate) 27Kg (Part)

System:BLT-S800

Advantages: Taking areo engines as the basic configuration carrier, the product combines the advantages of additive manufacturing with high flexibility design and the principle of additive manufacturing process adaptability. Through integrated design, it integrates typical complex features such as light-weight, spatial multi-scale structures,special-shaped curved surfaces, flow channel, etc. This product finally realizes the overall preparation of large-size components and partial flexble mobility features.

→ Applications of Aluminum Alloy

Cube Star Deployer

Size:150mm×150mm×400mm

Weight:1.16kg

Machine:BLT-S310

Advantages: This part is used on the new-generation manned spacecraft experimental ship carried by the Long March 5B rocket. It is the world's first metal-based 3D printing technology. The cubic star deployer completed by 3D printing is only half the weight of traditional mechanical processing products. The processing cycle has been shortened from the past few months to one week, which greatly reduces the design weight and improves the structural strength.

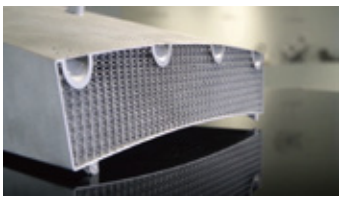
Guide Rail Bracket

Size:327mmX317mmX360mm

Weight:4.2kg

System:BLT-S500

Advantages: The minimum wall thickness of the thin-wall + lattice structure in the guide rail bracketr is 0.5mm, and the minimum lattice rod diameter is 0.5mm, which are extremely easy to deform. Compared with traditional processing, 3D printing can greatly reduce the weight of the parts while ensuring the strength. And the deformation is controllable.



→ Applications of Stainless Steel

Ring without Support

Size: ϕ150mm×20mm
Weight: 0.6kg
Machine: BLT-S310
Advantages: Build without support.

Astronaut Elbow

Size:370mm×40mm×15mm

Weight:310g

Machine:BLT-S300

Advantages:1. Make use of limited space to achieve functional first design; 2. Thin-wall surface integrated forming, no need for post-processing; 3. Stable performance, high yield, good surface quality.

06 APPLICATION AREAS

Aerospace

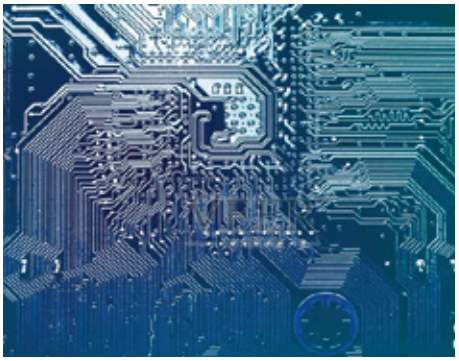
Applications: Fuselage Structural Parts, Aircraft Accessories, Engine Parts and Engine Control Components.

Medical and Dentistry

Applications: Denture and Oral Stent.

Automotive

Applications: Wheel, Rocker Arm, Steering Knuckle, Tire Mold, Piston, Cylinder Head, Exhaust Manifold and Intake Manifold.



Electronics

Applications: Radar Parts, Communication Components, Semiconductor, Cellphone Mould and HDMI.

Chemical

Applications: Oil Tubing, Energy Probe, Logging Instrument Accessories.

Mold

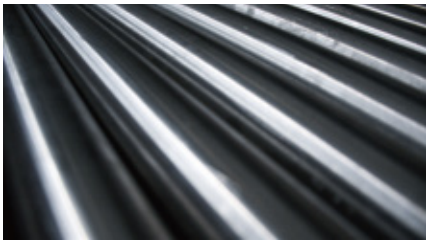
Applications: Injection Mold, Blow Mold,Pressure Mold.

07 VALUE-ADDED SERVICES

01

Powder Preparation

High quality titanium and titanium alloy powders for 3D printing are prepared by advanced EIGA technology.



02

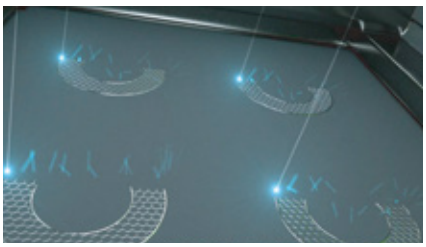
Powder Testing

The company is equipped with a standardized testing center for complete testing and analysis of powder performance.

03

Printing Verification

Powder products were verified on different types of SLM machines & systems.



04

Performance Testing

Microstructure and performance testing of printed parts provide supports for powder R&D.

08 TYPICAL USERS

Aerospace:

Medical:

R&D:

Vocational Schools:

Dentistry:

Mechanical Industry:

Energy and Chemical Engineering:

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