

LENS Printers

LENS metal 3D printers are ideally suited to fabricate, enhance and repair high-performance metal components used in Aerospace, Defense, Power Generation, and Medical device manufacturing industries. The LENS process cost-effectively builds three-dimensional structures with excellent material properties from a wide range of metals, including titanium, stainless steel, nickel, cobalt and other engineering alloys.



德芮達科技股份有限公司
DETEKT Technology Inc. Additive Manufacturing Expert

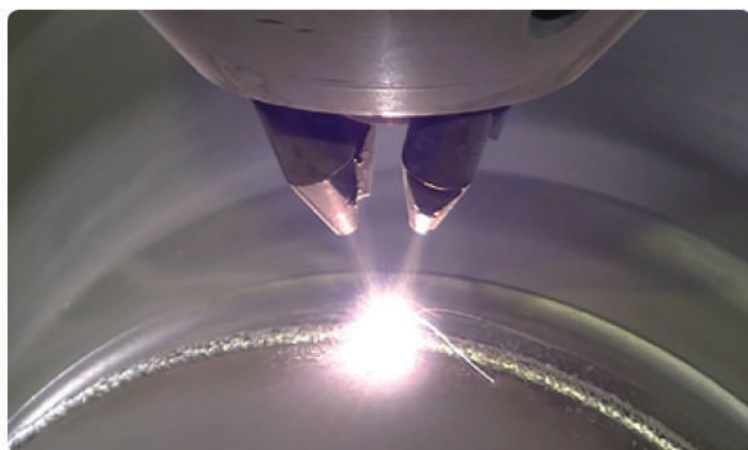
LENS[®] 450

The LENS[®] 450 brings industrial-strength metal 3D Printing technology to the laboratory and classroom

Additive Manufacturing, also known as 3D Printing, has recently emerged as the first manufacturing revolution of the 21st Century. Industrial applications are growing rapidly and processes are being qualified in numerous industries. In the area of metal Additive Manufacturing, applications such as repair, rework, coating and low volume manufacturing are being implemented across a wide range of industries, including oil and gas, aerospace, mining, power generation and medical.



LENS 450 System



LENS in action repairing a casing

The all-new LENS 450 system offers a low-cost entry to metal Additive Manufacturing. With a 100mm cubed working volume, 400W fiber laser and full LENS control software, the LENS 450 gives the user the same process as the industry-proven LENS 850R and MR-7, all with a smaller footprint and lower cost.

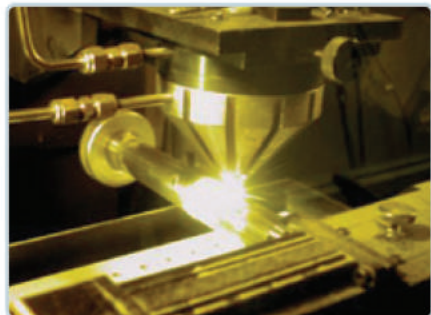
KEY FEATURES

- ▶ Blown Powder Deposition – visible, teachable process
- ▶ Industry-proven LENS process
- ▶ Rapid set-up – make a new material in ten minutes!
- ▶ High brightness solid-state Fiber Laser
- ▶ Rapid solidification rates [$>1000^{\circ}\text{C}$] – Novel microstructures
- ▶ Complete Atmosphere Control – full protection for highest quality
- ▶ Create mixtures - rapid alloy discovery

LENS 450 APPLICATIONS

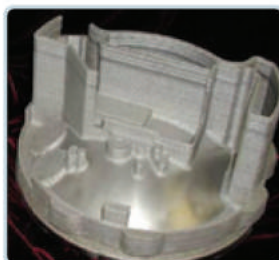
- ▶ Teaching and research on metal 3D Printing
- ▶ Rapid Manufacturing
- ▶ Rapid Prototyping
- ▶ Hybrid Manufacturing
- ▶ Rapid Alloy Screening
- ▶ Repair & Remanufacture

Laser Engineered Net Shaping



How the LENS system works:

LENS systems utilize a high-power laser together with powdered metals to build fully dense structures directly from a 3-dimensional CAD solid model. The CAD model is automatically sliced into a tool-path, which instructs the LENS machine how to build the part. The part is constructed layer by layer under the control of software that monitors a variety of parameters to ensure geometric and mechanical integrity. The LENS process is housed in a chamber which is purged with argon such that the oxygen level stays below 10 parts per million to ensure there is no impurity pick-up during deposition. The metal powder is fed to the process by Optomec's proprietary powder-feed system, which is able to flow small quantities of powder very precisely. When complete, the part is removed and can be heat-treated, Hot-Isostatic-Pressed, machined, or finished in any other manner.



Defense Housing
Fabricated by LENS System



Compressor Blade
Repaired by LENS System



Exhaust Duct
Fabricated by LENS System

LENS® 450 Typical Performance Parameters

Process Work Envelope	100 x 100 x 100 mm
Enclosure	Class I Laser Enclosure, Hermetically sealed to maintain process environment and safety
Motion Control	3-axes standard: XY linear table motion Z Gantry motion
Positional Accuracy	± .25mm
Linear Resolution	± .025 mm
Motion Velocity	60 mm/s
Deposition Rate	Up to 80 g/hr
Gas Purification System	Direct purge system to achieve low oxygen levels
Powder Feeders	One feeder (option to add one more) The feeder holds up to 2 kg of powder
Laser	400W IPG Fiber Laser
Software	Workstation Control; STL Editing; PartPrep slicing
Enclosure Dimensions	1 x 1 x 1.5 m, standalone unit

ABOUT OPTOMECH

Optomec® is the world leading provider of additive manufacturing systems for high-performance applications in the Electronics, Biomedical, Photovoltaic, and Aerospace & Defense markets. These systems utilize Optomec's patented Aerosol Jet technology for printed electronics and LENS technology for 3D printed metals.

LENS™ MR-7

Breakthrough additive manufacturing technology for the fabrication & repair of high performance metal components

LENS systems are used in the repair and rapid manufacturing of metal components in state-of-the-art materials such as titanium, stainless steel, and Inconel®. Use the LENS MR-7 System to rapidly create materials of exceptional quality.



LENS MR-7 System



Novel structures created by LENS

The LENS MR-7 system offers a 300mm cubed work envelope, making it ideal for the manufacture or repair of smaller components. LENS systems use energy from a high-power Fiber Laser to build up structures one layer at a time directly from powder – metals, alloys, ceramics or composites. The two powder feeders allow gradient materials to be made – every layer can have a different chemistry. This enables new materials to be made and analyzed with extraordinary speed. LENS systems are used throughout the entire product lifecycle for applications ranging from rapid alloy development and functional prototyping to rapid manufacturing or repair.

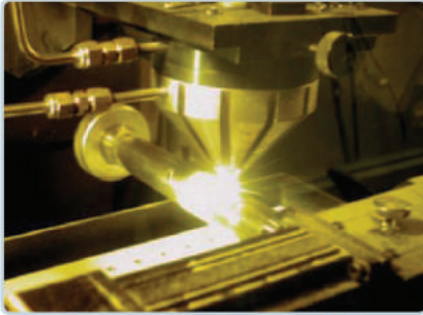
KEY FEATURES

- ▶ Multiple material capabilities
- ▶ Rapid set-up – make a new alloy in ten minutes!
- ▶ Create graded material samples - combinatorial chemistry
- ▶ Create mixtures - rapid alloy discovery
- ▶ Rapid solidification rates (>1000C) – Novel microstructures
- ▶ Complete Atmosphere Control – full protection for highest quality
- ▶ Calculate cooling rates – correlate to microstructure and properties

APPLICATIONS

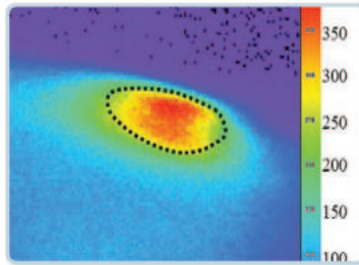
- ▶ Small component repair
- ▶ Rapid manufacturing
- ▶ Rapid Alloy Screening
- ▶ Hybrid manufacturing
- ▶ Advanced product development
- ▶ Fabrication and repair of components for aerospace and defense applications
- ▶ Medical Device Manufacturing

Laser Engineered Net Shaping

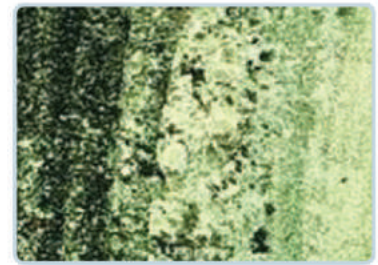


How the LENS system works:

LENS systems utilize a high-power laser together with powdered metals to build fully dense structures directly from a 3-dimensional CAD solid model. The CAD model is automatically sliced into a tool-path, which instructs the LENS machine how to build the part. The part is constructed layer by layer under the control of software that monitors a variety of parameters to ensure geometric and mechanical integrity. The LENS process is housed in a chamber which is purged with argon such that the oxygen level stays below 10 parts per million to ensure there is no impurity pick-up during deposition. The metal powder is fed to the process by Optomec's proprietary powder-feed system, which is able to flow small quantities of powder very precisely. When complete, the part is removed and can be heat-treated, Hot-Isostatic-Pressed, machined, or finished in any other manner.



View of the LENS Process from the optional Thermal Imager



Gradient microstructure produced by the LENS process

LENS MR-7 Typical Performance Parameters

Process Work Envelope	300 x 300 x 300 mm
Enclosure	Class I Laser Enclosure, Hermetically sealed to maintain process environment and safety
Motion Control	3-axes standard: XY linear table motion Z gantry motion Additional Axis Optional rotary dividing head All axes under full CNC control
Positional Accuracy	± .25mm
Linear Resolution	± .025 mm
Motion Velocity	60 mm/s
Deposition Rate	Up to 100 g/hr
Gas Purification System	Unit maintains O2 level ≤ 10 ppm
Dual Powder Feeders	Each feeder holds up to 2 liters of powder Gradient capability Optionally up to four feeders
Lasers	500W, 1kW or 2kW IPG Fiber Laser
Software	Software Workstation Control; STL Editing; PartPrep slicing
Thermal Imager	Stratronics Thermo-Viz Thermal Imager Dual Wavelength Pyrometer Image Acquisition and Analysis Software
Enclosure Dimensions	3 x 1.5 x 2.5 m without gas purification system or laser
Monitoring and Controls	Optional Melt-Pool Sensor Optional Thermal Imager

ABOUT OPTOMEC

Optomec® is the world leading provider of additive manufacturing systems for high-performance applications in the Electronics, Biomedical, Photovoltaic, and Aerospace & Defense markets. These systems utilize Optomec's patented Aerosol Jet Printed Electronics technology and LENS powder-metal fabrication technology.

LENS[™] 850-R

Proven Industrial Additive Manufacturing System for Repair, Rework, Modification and Manufacturing

LENS 850-R is a state-of-the-art Additive Manufacturing system, using advanced alloys to restore the functionality of high value metal components.



LENS 850-R System



Impeller repaired by LENS 850-R System

The LENS 850-R system offers a large 900 x 1500 x 900mm working volume, making it ideal for repair, rework and modification of large industrial components. The LENS 850-R uses a high-power IPG Fiber Laser to build up structures one layer at a time directly from metal powder. The resulting material has mechanical properties that can be equivalent to or superior than the original component. The 850-R offers a full range of features, including 5-axis CNC-controlled motion, closed-loop controls, and full atmosphere control. These features, backed by Optomech's full application and service support, make the 850-R the system of choice for industrial additive manufacturing users.

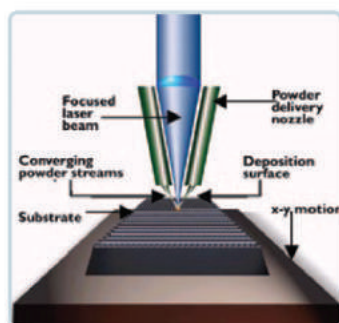
FEATURES

- ▶ Large working volume - ideal for blisks, impellers and shafts
- ▶ 5-axis motion - rotary and complex repairs
- ▶ Closed-loop controls – precision process control
- ▶ Fiber Lasers – Reduced cost of ownership
- ▶ Full software suite – generate toolpaths rapidly
- ▶ Full atmosphere control – superior material quality
- ▶ Common materials: Inconel Alloys, Stainless Steels, Titanium alloys

APPLICATIONS

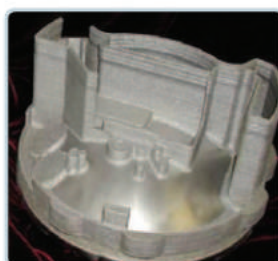
- ▶ Repair of worn components
- ▶ Rework of mis-machined components
- ▶ Modification of tooling for re-use
- ▶ Hybrid Manufacturing
- ▶ Advanced Product Development

Laser Engineered Net Shaping



How the LENS system works:

LENS systems utilize a high-power laser together with powdered metals to build fully dense structures directly from a 3-dimensional CAD solid model. The CAD model is automatically sliced into a tool-path, which instructs the LENS machine how to build the part. The part is constructed layer by layer under the control of software that monitors a variety of parameters to ensure geometric and mechanical integrity. The LENS process is housed in a chamber which is purged with argon such that the oxygen level stays below 10 parts per million to ensure there is no impurity pick-up during deposition. The metal powder is fed to the process by Optomec's proprietary powder-feed system, which is able to flow small quantities of powder very precisely. When complete, the part is removed and can be heat-treated, Hot-Isostatic-Pressed, machined, or finished in any other manner.



Defense Housing
Fabricated by LENS System



Compressor Blade
Repaired by LENS System



Exhaust Duct
Fabricated by LENS System

LENS 850-R Typical Performance Parameters

Process Work Envelope	900 x 1500 x 900 mm
Enclosure	Class I Laser Enclosure, Hermetically sealed to maintain process environment and Safety
Motion Control	5-axes standard: XYZ linear gantry motion Tilt-Rotate worktable All axes under full CNC control
Positional Accuracy	± .25mm
Linear Resolution	± .025 mm
Motion Velocity	60 mm/s
Deposition Rate	Up to 0.5 kg/hr
Parts Handling	Tilt-Rotate table tilts +/- 90°, infinite rotation. Rails and part cart allow table to move through machine and out. 38 cm diameter antechamber.
Gas Purification System	Dual unit maintains O2 level continuously ≤ 10 ppm
Powder Feeder	Two feeders each hold up to 14 kg of powder
Lasers	1, 2, 3, or 4 kW IPG Fiber Laser
Software	G-code Workstation Control; STL Editing; Part-Prep slicing
Closed-Loop Controls	Optional melt-pool-sensor
Enclosure Dimensions	3 x 3 x 3 m w/o gas purification system or laser

ABOUT OPTOMECH

Optomec® is the world leading provider of additive manufacturing systems for high-performance applications in the Electronics, Biomedical, Photovoltaic, and Aerospace & Defense markets. These systems utilize Optomec's patented Aerosol Jet Printed Electronics technology and LENS powder-metal fabrication technology.

LENS® PRINT ENGINE

Add Laser Deposition Capability to Any CNC Machine Tool

The LENS Print Engine provides Optomec industry proven metal 3D Printing technology in a modular form and makes it available for integration with other metal working platforms such as mills, lathes, robots, custom gantries, or table system. Now metal deposition and machining can be performed in the same system allowing you to leverage capital assets and accelerate implementation of additive technology through an HMI already familiar to your machinists.



New or Pre-Owned CNC Machine Tool



LENS Additive Repair

The modular LENS Print Engine components include Optomec proprietary SteadyFlow Powder Feeders, PrecisionFlow Deposition Heads, LENS Process Controls, fiber laser support, integrated tool path generation software, and full safety packages. Combined with a CNC machine tool, the LENS Print Engine simplifies metal fabrication applications such as net shape rapid prototyping, hybrid manufacturing, full production, in-situ repair, manufacturing rework and more.

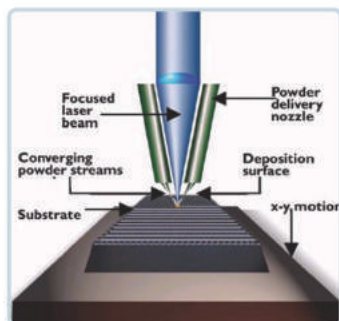
KEY FEATURES

- ▶ Industry-leading Deposition Heads
- ▶ Best-in-Class Powder Feed System
- ▶ Industry Proven Control System
- ▶ Integrated Toolpath Generation Software
- ▶ Support for fiber-delivered lasers, including IPG
- ▶ Full Safety Packages

APPLICATIONS

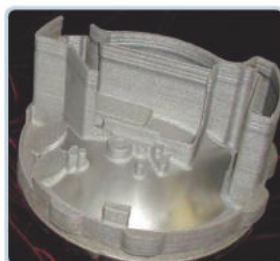
- ▶ Net Shape Rapid Prototyping & Manufacturing
- ▶ Hybrid Manufacturing
- ▶ Manufacturing Rework
- ▶ In-situ Repair
- ▶ Addition of Wear Surfaces
- ▶ Cladding and Surface Modification

Laser Engineered Net Shaping



How the LENS Print Engine works:

LENS Print Engine systems utilize a high-power laser together with powdered metals to build fully dense structures directly from a 3-dimensional CAD solid model. The CAD model is automatically sliced into a tool-path, which instructs the LENS machine how to build the part. The part is constructed layer by layer under the control of software that monitors a variety of parameters to ensure geometric and mechanical integrity. The LENS Print Engine is housed in any suitable machine tool – a CNC mill, a lathe, a vertical or horizontal machining center, a robot, gantry, or any other suitable motion package. Optomec's LENS Print Engine Control System provides full industrial CNC control of both the LENS Print Engine components and the machine tool itself. Add appropriate safety systems, Optomec's applications knowledge and process support, and a full system can be implemented in any machine shop.



Defense Housing
Fabricated by LENS/CNC Process



Compressor Blade
Repaired by LENS System



Exhaust Duct
Fabricated by LENS System

LENS Print Engine Example Installations

FEATURE	POSSIBLE INSTALLATION
Motion	Vertical or horizontal machining center, new or used Robot or Custom Gantry
Controller	LENS Print Engine Control System Customer-supplied control, with M-codes for LENS Engine control
Toolpath Generation	Art-to-Part Toolpath Software Conversational Toolpath Generation Utilities
Deposition Head	PrecisionFlow Deposition Head
Powder Feeder	SteadyFlow Powder Feed System, up to 8 powder feeders per LENS Print Engine system
Laser	IPG Fiber Laser Other fiber-delivered lasers
Safety	Full safety packages, including laser-safe glass and interlocks
Key Process Variable Monitoring	All standard LENS calibration systems
Process Parameters	Full training in process, operation and maintenance
Support	Full Optomec applications and service support

LENS PRINT ENGINE MODULAR COMPONENTS



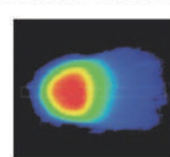
Deposition Heads



Powder Feeders



Motion Controller



Process Controls



Tool Path Software

ABOUT OPTOMECH

Optomec® is the world leading provider of additive manufacturing systems for high-performance applications in the Electronics, Biomedical, Photovoltaic, and Aerospace & Defense markets. These systems utilize Optomec's patented Aerosol Jet technology for printed electronics and LENS technology for 3D printed metals.



德芮達科技股份有限公司

DETEKT Technology Inc. Additive Manufacturing Expert

23675 新北市土城區中央路四段51號4樓之3

TEL:(02)2267-3158 | FAX:(02)2267-2058

Http://www.detekt.com.tw | info@detekt.com.tw