

# 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.



Novel structures created by LENS



LENS MR-7 System

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.

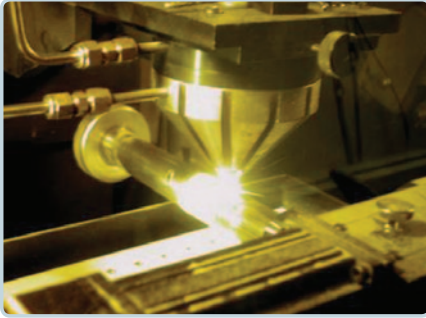
### KEY FEATURES

- ▶ 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

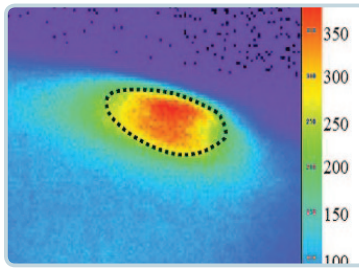
- ▶ Small component repair
- ▶ Rapid manufacturing
- ▶ Rapid Alloy Screening
- ▶ Hybrid manufacturing
- ▶ Advanced product development
- ▶ Fabrication and repair of components for aerospace and defense applications
- ▶ Medical Device Manufacturing

## Laser Engineered Net Shaping

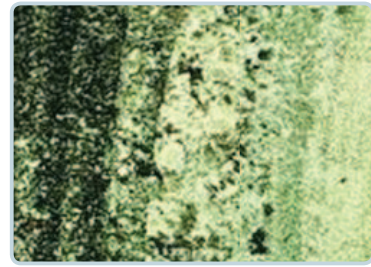


### How the LENS system works:

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 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.