

The PANDA™ Metal 3D Printing System



Accelerating innovation.

Simply ***the best value*** to unleash researchers, technologists, and part producers to create on an open, high-performance laser powder bed platform.



PANDA is ideal for:

- Basic and applied research
- AM technology development
- Materials research
- Applications development
- Training and education
- General manufacturing services

Key features:

- Multiple build size options
- Configurable lasers/optics
- Powerful control software
- Advanced process monitoring
- No materials restrictions
- Safe for reactive powders

RESEARCH AND DEVELOPMENT

- ✓ Provides unsurpassed value, configurability, and control to accelerate fundamental and advanced development of laser powder bed processing, monitoring, and materials technologies

TRAINING AND EDUCATION

- ✓ Designed in a smart, safe industrial layout for introduction and mastery of metal AM processes across learning levels – includes safety interlocks, laser-safe enclosure, and automated shut off

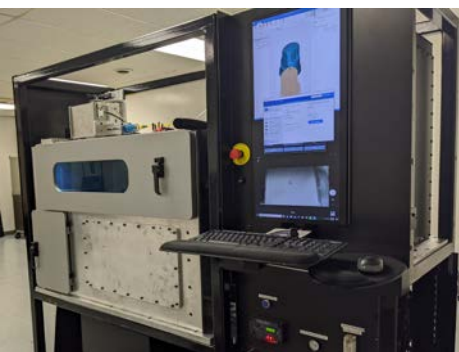
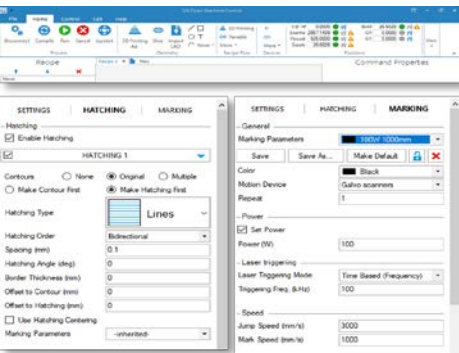
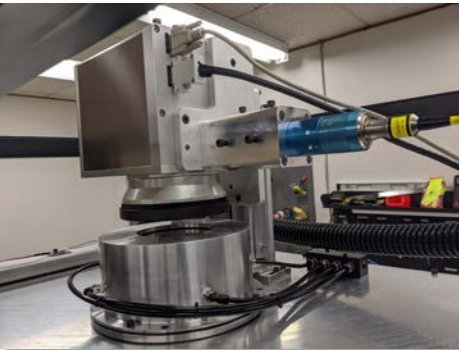
PROTOTYPING AND PRODUCTION

- ✓ Features high-power lasers and high-performance optics from leading vendors, and includes full control of all parameters for processing high-quality parts across a wide range of materials





Metal Additive Manufacturing, Made Open



OPEN ARCHITECTURE

Modular design is suitable for integration of add-on technologies as developed



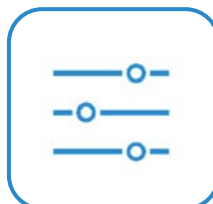
OPEN CONFIGURATION

Standard options and custom configurations for your materials and applications



OPEN MATERIALS

No restrictions on feedstock, process recipes and technical data provided as available



OPEN PARAMETERS

Complete control of processing parameters, with advanced features and plugin capabilities



OPEN SENSING

Ability to access and analyze all data from optional multi-sensor process monitoring suite



OPEN MAINTENANCE

No warranty or service plan restrictions on basic servicing to keep your system running



Base Build Configurations

Small Build Configuration (PANDA-SM)

- 6.0 × 6.0 × 9.5 in (152 × 152 × 241 mm)
- Ideal for R&D, training/education, and smaller parts

Large Build Configuration (PANDA-LG)

- 11.0 × 11.0 × 12.5 in (280 × 280 × 318 mm)
- Ideal for prototyping and production of larger parts

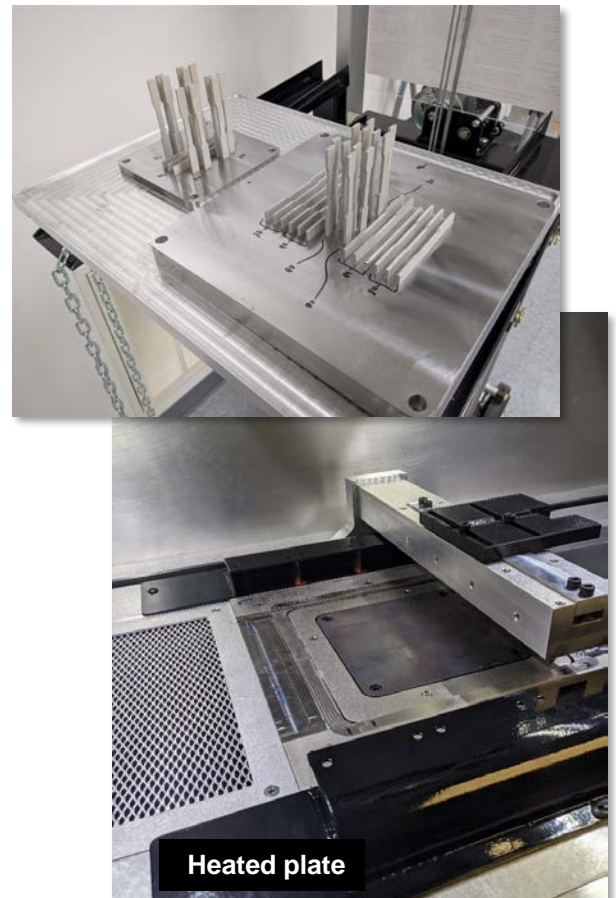
High Temperature Configuration (PANDA-HT)

- 6.0 × 6.0 × 9.5 in (152 × 152 × 241 mm) or 4.0 × 4.0 × 9.5 in (100 × 100 × 241 mm), with heated plate to 500°C; includes all system modifications for processing at temperature (insulation, heat-resistant components, scan head chiller, heater controls, and separate filter housing to allow for flow cooling) – for processing difficult materials

Custom Build Configuration (PANDA-CC)

- We can build a custom configuration to meet your unique research, technology development, or production needs

Note: Build volume height does not account for build plate, as different thickness plates may be used for different materials or applications.



Laser Delivery System Options



Lasers

- 500 W IPG Photonics 1070 nm fiber laser (air-cooled)
- 1000 W IPG Photonics 1070 nm fiber laser (includes chiller)
- Single or dual laser configuration
- Custom laser integration (e.g., visible or pulsed lasers)

Optics

- Affordable high-performance galvo setup features SCANLAB hurrySCAN scan head and F theta lens on z-stage for adjusting laser focus (see left) – available on single laser configuration only
- State-of-the-art SCANLAB fiberSYS “all-in-one scanning system” for dynamic, on-the-fly spot size control, includes coaxial sensor port (sensor not included) – available for both single or dual laser
- Custom optics integration to meet project needs

Standard Features

Recoater Assembly

- Unique triple-blade recoater accommodates hard and soft blades, allowing use of one or more blades at once
- Simple to adjust and replace blades
- Includes threaded holes on recoater arm for attaching add-on mechanisms as necessary

User Interface

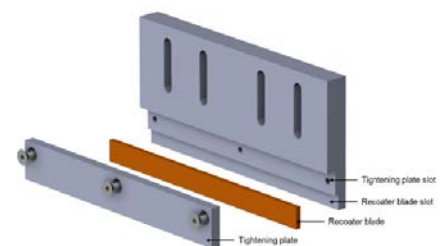
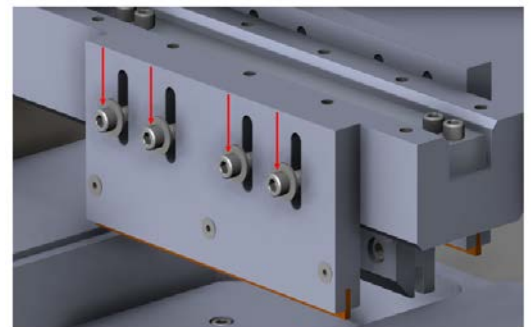
- System includes full Windows 10 workstation with wireless keyboard, mouse, and USB access
- Large 29 in (74 cm) monitor allows simultaneous viewing of machine control software, environmental control dashboard, and live camera feed (build camera is included)
- Ability to run ancillary software and use remote desktop software to access system from another location

Control Software

- Open Machine Control™ is a complete software solution – load models, arrange on plate, add supports, set scan parameters, perform slicing, and execute the build
- Multiple input file formats (e.g., STL, STEP, CLI, IGS)
- Full control of all process parameters, with ability to subdivide hatching and contour zones
- Includes plugin capabilities for coding advanced strategies

Environmental Control

- Suited for both reactive and non-reactive powders
- Dashboard provides easy setup and real-time displays
- Cross-bed flow removes soot and debris, with cross-optics flow for preventing debris accumulation on laser optics
- Two-stage filter collects debris with minimal maintenance, optional industrial quick-change external filter available





PANDA Facility and Safety Requirements

Footprint – Work area 10 × 10 feet (3 × 3 m) is adequate, with at least 18" (0.5 m) separation from walls, the system measures approximately 76 × 29 × 80 in (1.9 × 0.7 × 2.0 m), can be fit through standard single doorway

Flooring – No special flooring is generally required if used with an anti-static ESD mat

Electrical – One 200-240V/20A circuit (per laser) and one 110-120V/15A circuit (for other components), all single phase (note: 1000 W lasers require an additional 200-240V circuit for chiller)

Shielding Gas – System requires externally supplied shielding gas (e.g., Ar or N₂) – Dewars or central supply via bulk tank recommended, fittings will be provided as needed on system installation

Ventilation – Typically no special accommodations are necessary if used in a well-ventilated area

Environmental – Normal indoor conditions to maintain room temperature are generally adequate, dehumidifier recommended in humid conditions, additional controls may be used for production needs

Powder Handling – Proper equipment for powder clean up, recycling, and storage should always be used when working with metal powders; and proper containers and waste removal services should be used for powder disposal, in accordance with environmental regulations – see ancillary equipment

Fire Safety – Type D extinguisher should be available for use on metal powder or condensate, reactive powders should always be stored in a flammables storage cabinet

Laser Safety – System operates as a Class 1 device per ANSI Z136.1 Safe Use of Lasers, with laser safe windows and interlocks, preventing operation with a door ajar and no special eyewear needed

Personnel Safety – Operators should use lab safety glasses, nitrile gloves (or equivalent), powered air purifying respirator, anti-static lab coat, and antistatic shoe covers or conductive soles when system is open for build setup, build removal, cleaning, maintenance, or other actions creating possibility for direct exposure to metal powders, and contaminated PPE items should be disposed of as hazardous waste

Customers should always consult their safety office for guidance; additional information/resources available at: https://openadditive.com/wp-content/uploads/2021/01/PANDA_Facility_Considerations.pdf.

Optional Process Monitoring

AMSENSE® is a multi-sensor process monitoring suite developed by Open Additive, offered as an integrated option for Open Additive systems and as an add-on package for industrial platforms

AMSENSE features:

- Modular design allows for customization and expansion through software plugins
- Users have fully open access to all raw and/or processed data
- Multiple sensor modules available, more sensors and process control analytics in development
- Intuitive Windows GUI for control of sensor settings, data archiving, and visualization

Current Sensor Modules



Recoat Imaging Sensor

- Features 12 MP camera with automated image capture before/after each powder recoat

Thermal Tomography Sensor

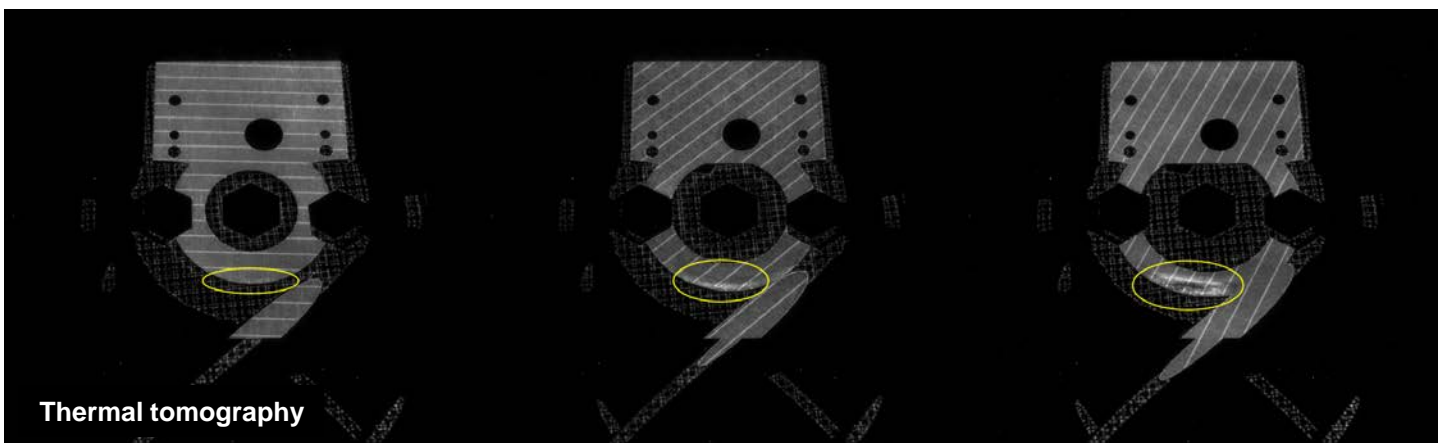
- Features 12 MP camera filtered in NIR band to create a composite image of emissions on a layer-by-layer basis during the build
- Useful tool for detecting spatter, short feeds, part peel-up, warping, and delaminations

Spatter Tracking Sensor

- Uses 2 MP camera in NIR band for automated identification and tracking of spatter events for statistical analysis and review
- May be used to identify deviation from normal process conditions

Custom Sensors/Analytics

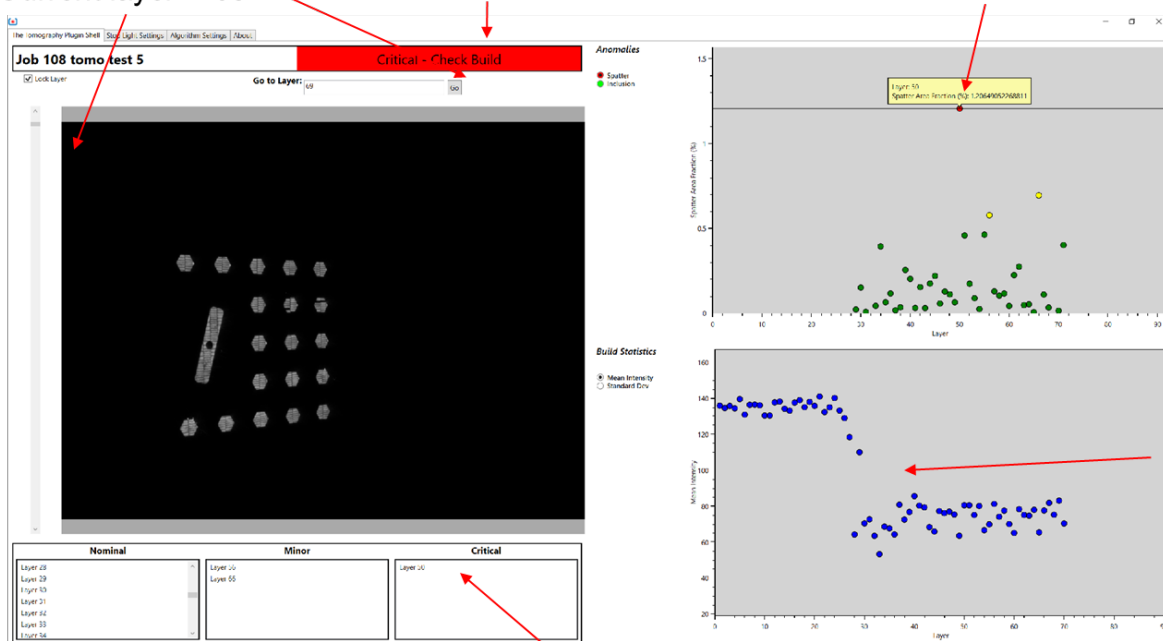
- We can develop, demonstrate, evaluate, and implement novel sensor/analytics solutions



Analytics Screenshots



Current layer = 69 Critical anomalies found in build Critical Spatter Anomaly at Layer 50



Critical Spatter Anomaly at Layer 50

Build Your Own PANDA

Open Pricing for Open, Configurable Systems

BASE BUILD CONFIGURATION (choose one)

		INDUSTRY	EDU / GOV
PANDA-SM	Small build configuration, 6x6x9.5 in (152x152x241 mm)	\$199,000	\$179,100
PANDA-LG	Large build configuration, 11x11x12.5 in (280x280x318 mm)	\$249,000	\$224,100
PANDA-HT	High temperature configuration, 6x6x9.5 in (152x152x241 mm) with heated plate to 500°C; also available 4x4 in (100 mm) plate	\$299,000	\$269,100
PANDA-CC	Custom build configuration	Inquire	Inquire

LASER DELIVERY CONFIGURATION (choose one)

LDS-S500	Single laser, 500 W 1070 nm with hurrySCAN / F-theta / z-stage	\$50,000	\$45,000
LDS-S1000	Single laser, 1000 W 1070 nm with hurrySCAN / F-theta / z-stage	\$75,000	\$67,500
LDS-S500-FS	Single laser, 500 W 1070 nm with SCANLAB fiberSYS	\$100,000	\$90,000
LDS-S1000-FS	Single laser, 1000 W 1070 nm with SCANLAB fiberSYS	\$125,000	\$112,500
LDS-D1000-FS	Dual laser, 2 x 500 W 1070 nm with SCANLAB fiberSYS	\$195,000	\$175,500
LDS-D1500-FS	Dual laser, 500 W & 1000 W 1070 nm with SCANLAB fiberSYS	\$220,000	\$198,000
LDS-D2000-FS	Dual laser, 2 x 1000 W 1070 nm with SCANLAB fiberSYS	\$245,000	\$220,500
LDS-CUSTOM	Custom laser delivery configuration	Inquire	Inquire

PROCESS MONITORING OPTIONS (choose none, one, or more)

AMS-RECOAT	AMSENSE recoat imaging sensor	\$15,000	\$13,500
AMS-TOMO	AMSENSE thermal tomography sensor	\$30,000	\$27,000
AMS-SPAT	AMSENSE spatter tracking sensor	\$30,000	\$27,000
AMS-CUSTOM	Custom sensing/analytics development or integration	Inquire	Inquire

NO HIDDEN COSTS

Prices include perpetual software license, as applicable, with 3 years of upgrades as available; system installation; initial training; 1-year warranty, service plan, and technical support; and metal 3D printing starter kit (hand tools, anti-static ESD mat, build plate, initial powder). Extended warranty and service plans available to 2 or 3 years (add 7.5% or 15% to equipment price, respectively). Prices do not include shipping, handling, travel, taxes, or other location-specific costs.

You can also visit our online pricing and configuration tool at <https://tinyurl.com/buildmypanda>.

Products and prices subject to change without notice.

Ancillary Equipment



Powder Sieving Station

Need support equipment for your AM operations?



Hand Cart



External Filter

ANCILLARY EQUIPMENT OPTIONS (choose none, one, or more)

		INDUSTRY	EDU / GOV
ADD-CART	Build prep/removal cart, provides mechanized assistance and machined plate tailored for use with the PANDA system	\$4,000	\$3,600
ADD-SAFPPE	Personnel safety package, includes two powered air-purifying respirators with hoods & filters, two ESD anti-static aprons, ESD anti-static reusable foot-heel straps, and 100-count nitrile gloves	\$6,000	\$5,400
ADD-SAFFAC	Facility safety package, includes one Type D fire extinguisher, one flammables storage cabinet (30-gal capacity), steel drum and tags/bags for disposal of powder-contaminated items, and external O2 sensor with alarm for monitoring room oxygen level	\$8,000	\$7,200
ADD-SMVAC	Portable explosion-proof vacuum for use with metal powders	\$12,000	\$10,800
ADD-EXFILTER	Quick-change external filter system, ideal for industrial applications requiring separate filters for different materials or rapid swaps, suitable for reactive and non-reactive powders	\$15,000	\$13,500
ADD-SIEVE	Powder sieving station designed and built by Open Additive, features sealed structure with glove box, inert gas hookups, environmental controls, automated sieve shaker, and safety features, for use with both reactive and non-reactive powders	\$30,000	\$27,000
ADD-SIEVEDP	Powder sieving station with depowdering chamber, similar to standard sieve station but includes second chamber designed for mounting parts on rotating platen with vacuum and blower ports to contain powder during post-build cleaning of complex parts	\$50,000	\$45,000
ADD-CUSTOM	Customer-specified support equipment	As required	As required

Additional Services

How can we help your organization get started or accelerate in metal AM?

Technology Development

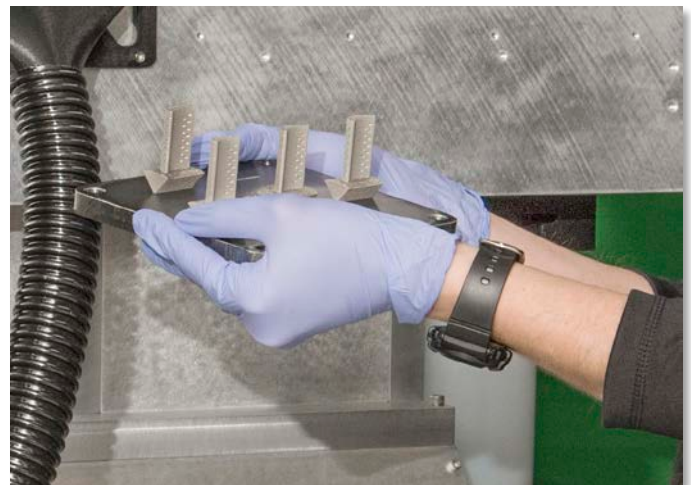
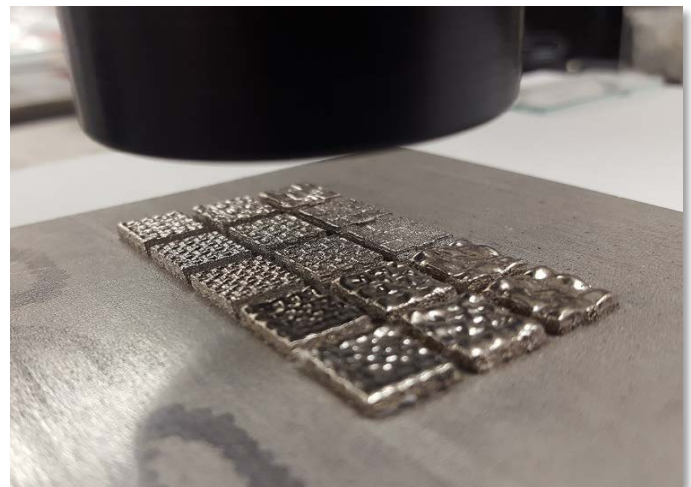
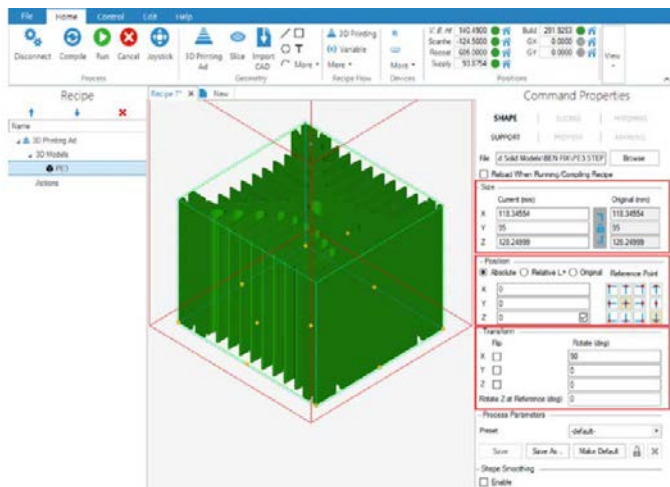
- We work as lead or sub/supplier to develop and demonstrate AM processing technologies
- Contact us to see how we can help boost your research/technology proposal or project

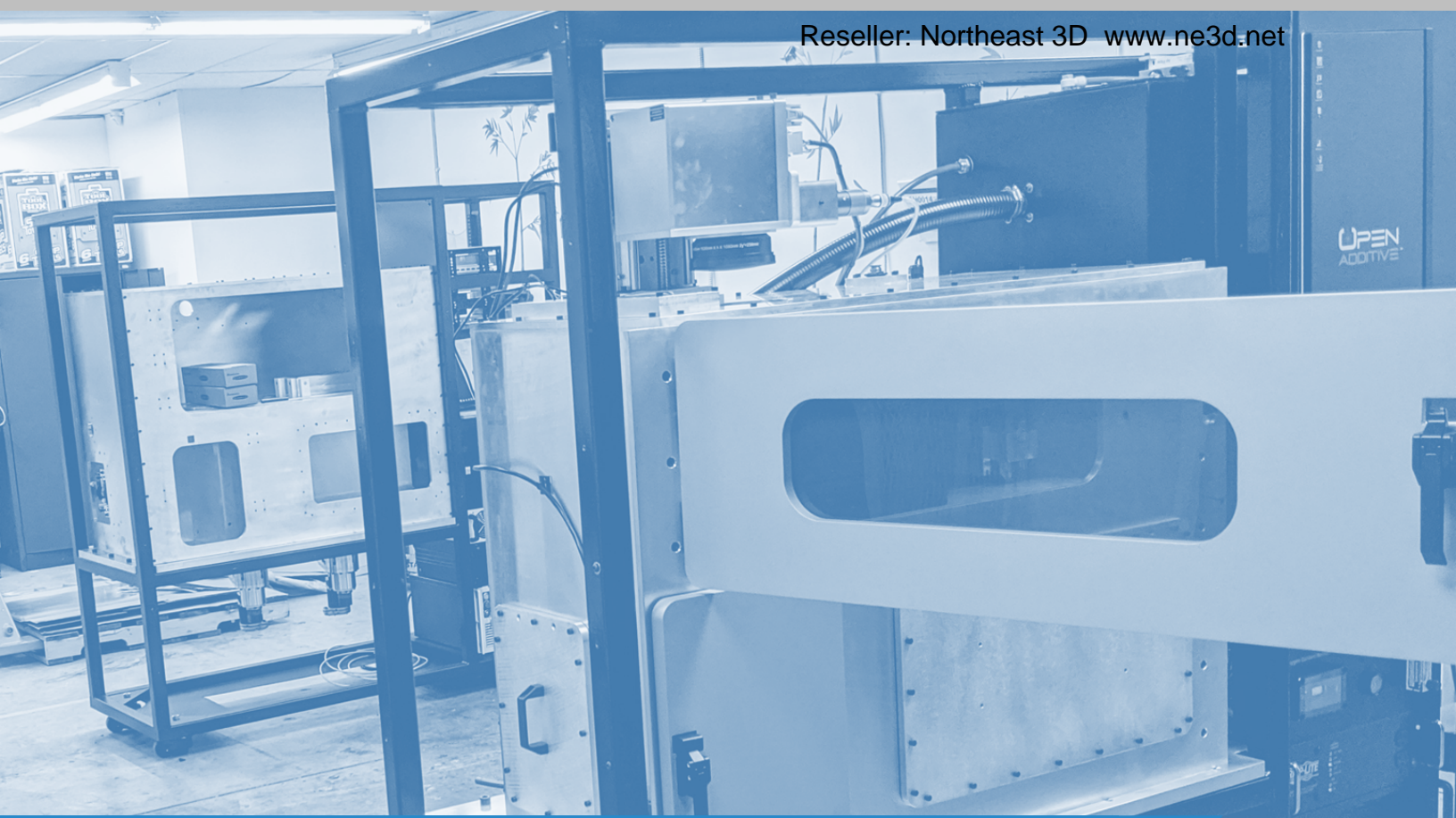
Applications Development

- We provide design for AM, materials parameters development, and prototyping services
- Contact us to discuss how we can help solve your AM application challenges

Product Demonstrations

- We provide evaluation builds and limited production services
- Contact us to discuss how we can use PANDA capabilities for your manufacturing needs





Contact us for a formal quotation or more information.



Open Additive, LLC
2750 Indian Ripple Road, Suite A
Beavercreek, Ohio 45440
+1 (937) 306-6140
sales@openadditive.com



All Open Additive systems are proudly designed and built in the USA.