M - METAL AM SYSTEMS

ROBOTIC 3D METAL PRINTING



MX3D

mx3d.com

M - METAL AM SYSTEMS

Building on extensive experience with >60,000 kg of printed metal, the MX3D M - Metal AM Systems ensures quality for Robotic Wire Arc Additive Manufacturing (WAAM).

The M-Systems are built for WAAM. It offers a turnkey solution to get started with WAAM fast and print high-quality, medium- to large-scale industrial metal parts. The systems are fully integrated with MetalXL, MX3D's dedicated WAAM workflow for advanced process control/ monitoring to go from CAD to qualified print in one go.

The system uses quality hardware components from renowned manufacturers. Our systems include an 8+-axis industrial robotics system for complex prints, a multi-transfer-mode GMAW power source for flexible print procedures, and the WAAM-dedicated MetalXL Control System for intelligent automation, real-time print monitoring, and closed-loop control.

The **M1** is our standard advanced turnkey solution for medium- to large-scale parts to get started with printing fast. For larger, heavier fabrication (>2m, >1t), the **MX** offers a customizable robotic WAAM system tailored to your requirements. If you want a WAAM system for localized field operations, the **MD** is our ruggedized, deployable WAAM system in a 20ft or 10ft container. Finally, the **MB** offers a foundation WAAM system for confined facilities. All of them run on our WAAM-dedicated MetalXL workflow.



M - BENEFITS

PRINT QUALITY

With our integrated metal alloys and printing strategies library and dynamic in-process parameters control, we achieve excellent material properties on a large range of metal alloys even at a high depostion rate.

PROPRIETARY SOFTWARE

MetalXL, our proprietary E2E workflow software, is fully dedicated to WAAM technology to achieve high quality, and completely integrated with a sensor system to have real-time control.

MANUFACTURING SPEED

The M - Metal AM Systems have a deposit rate up to 8kg per hour per power source. With higher speed, you can reduce lead time, manufacturing time and parts cost much more effectively. With MX3D's custom solutions, such as multi-robot or dual wire-feed setups, higher deposit rates can be achieved.

LOW COSTS

With our M - Metal AM Systems, the costs are upto 50% lower CAPEX and >3x cheaper OPEX compared to powder-based and laser-based 3D metal printing.

EASY TO USE

Fast operator adoption due to high workflow automation requiring only basic engineering skills to operate.

MATERIAL LIBRARY

Our M - Metal AM Systems allows printing with every weldable alloy, including steels, aluminiums, bronze, nickel and copper-based alloys.





METAL XL

MetalXL is built by MX3D to enable 3D metal printing of medium- to large-scale metal parts in-house, using robotic WAAM technology.

Its **streamlined end-to-end workflow** allows our users to easily manage the whole printing process from design to print.

It offers diverse features to both print with pre-set metal alloys and process parameters, or customise the entire process to your own needs.

Connected to the **MetalXL Control System**, it provides advanced print monitoring and control in real-time.



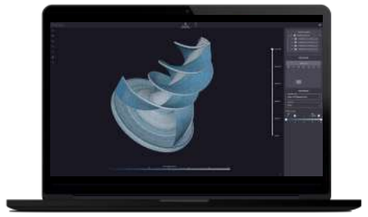
MetalXL CAM

WAAM-dedicated CAM including material library and optimised toolpath and infill strategies.



MetalXL LIVE

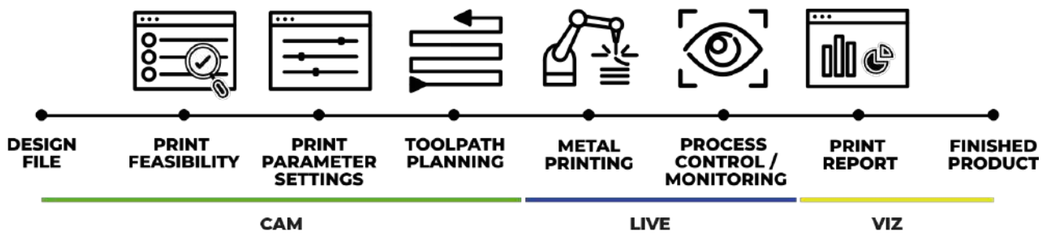
Real-time and high-resolution data collection of key print process parameters.



MetalXL VIZ

3D visualisation of logged process data for analytics, tracability and certification.

DEDICATED WAAM SOLUTION FROM CAD TO PRINT IN ONE GO



METAL XL - CONTROL SYSTEM

PROCESS CONTROL

- Advanced sensors to measure key parameters in real-time directly from the torch.
- Dynamic toolpath streaming that pushes the next layer when passing set parameter levels (e.g. interpass temperature).
- Automated start/stop based on real-time anomaly detection.

PROCESS MONITORING

- High-resolution logging and visualisation of key parameters.
- Monitor the printing process live layer-by-layer on the digital twin.
- Live alerts on unexpected print parameter deviations pushed to the operator's preferred device.

PRINT ANALYTICS

- 3D visualisation of logged key parameters during print.
- Detect, filter and analyse deviations during the printing process.
- Visualise the logged data after printing as a 3D point cloud, and compare it to the printed object to optimise the printing parameters.



HIGH-RESOLUTION DATA COLLECTION

- High-resolution welding parameters, including current, voltage, wire feed speed, gas flow, etc.
- Key print process / productivity metrics, including weld time, energy usage, system uptime, etc.
- Advanced dynamic tracking of interpass temperature, layer cooling time and active cooling.

3D SCANNING

- Automated, high-resolution topographical scanning to verify physical part geometry layer-by-layer.
- Real-time comparison of the physical print against the original digital CAD model to ensure near-net-shape accuracy.
- Integrated scanning of broken or worn components for reverse engineering, enabling repairs.

CERTIFICATION



MX3D is the world's first DNV AMC3-certified Wire Arc Additive Manufacturing (WAAM) facility, qualified in accordance with the official DNV-ST-B203 standard. This top-tier classification validates our capability to produce highly critical metal components for the most demanding high-load structural applications where failure is not an option. Our M-Metal AM Systems and WAAM-dedicated MetalXL workflow are fundamental to this qualification, demonstrating quality control over the entire end-to-end printing process.

USER STORY

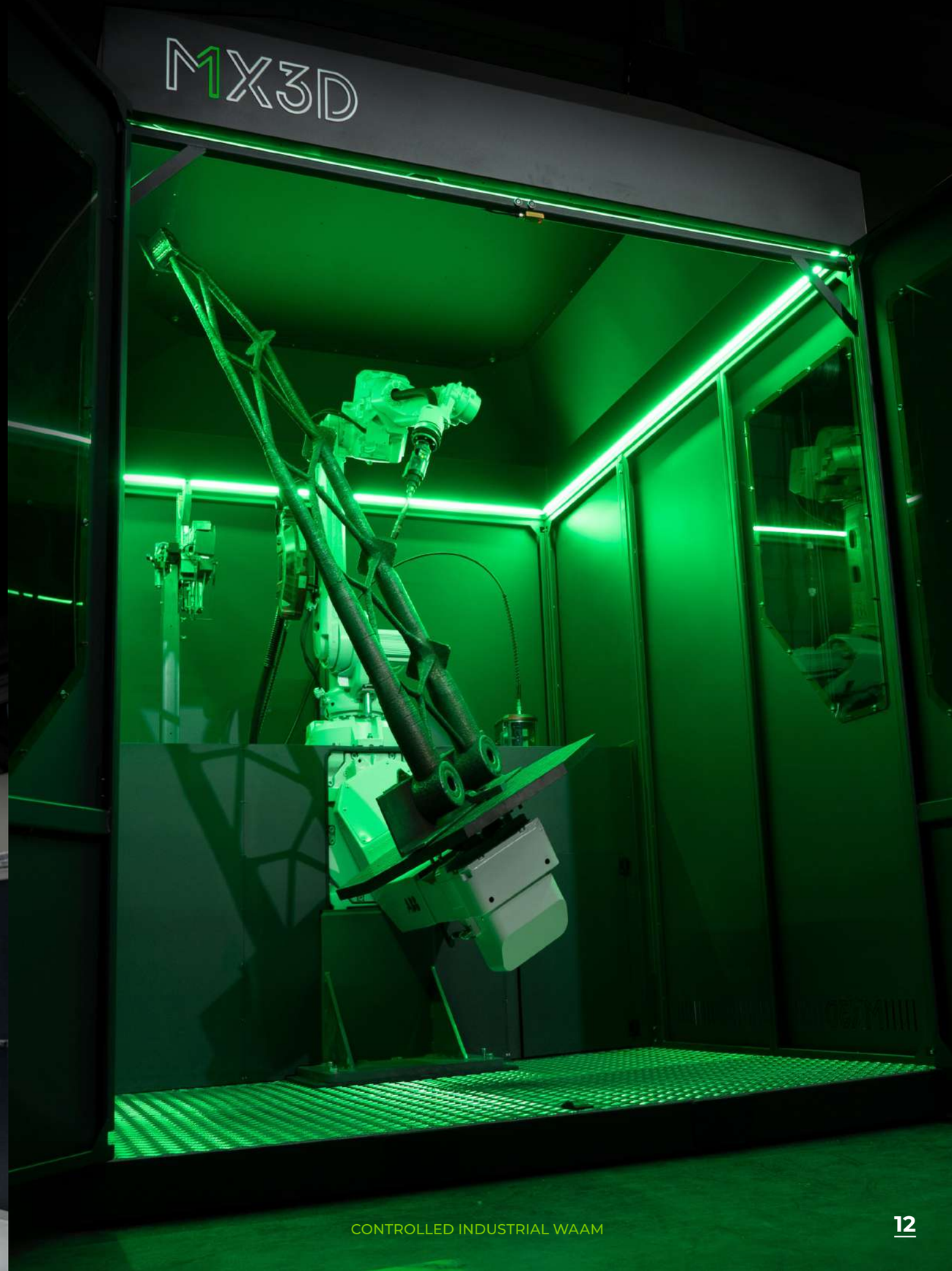
BMW Group uses its **M1 Metal AM System** and proprietary software MetalXL to 3D print automotive components. With more than 30 years of experience in additive manufacturing, BMW Group has been a pioneer in the field of additive manufacturing. Since their engineers started working with WAAM processes, they discovered that WAAM technology could lead them to lower emissions in the production process and reduce material usage, while at the same time maintaining cost-effective and efficient production. BMW Group states that WAAM components have passed tests confirming strength and consistent quality without requiring complete surface post-processing.

BMW GROUP

"The BMW Group engineers were able to show that WAAM components can be used for high, including cyclic, loads even without post-treatment of the surface. To ensure durability directly from production, optimized process parameters are crucial: the combination of welding process and robot path planning must be optimally coordinated."

- BMW Group





M1 - METAL AM SYSTEM

M1 - CONFIGURATION



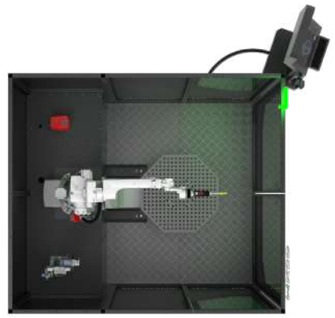
ADVANTAGES

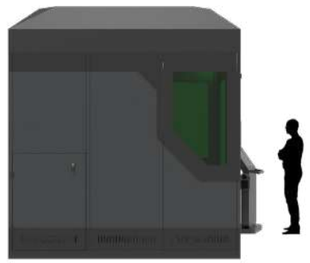
- Equipped with renowned industrial hardware in a ready-to-print setup.
- Print with 8-axis for increased freedom of geometry.
- Multi-transfer mode CMT and MIG/MAG power source.
- Integrated sensors and control system for advanced process control and monitoring, including add-on MetalXL 3D Scanner and/or thermal camera.

FULLY INTEGRATED WITH METALXL

- From design, plan your print with the MX3D high-quality MetalXL workflow and push it directly to the robot.
- Track and monitor your print on the MX3D MetalXL Control System.
- Digital twin of the print for optimal parameter assessment and components certification.
- Continuous high-resolution print monitoring with real-time print alerts on your operator's preferred device.







	STANDARD	CONFIGURATION OPTIONS		
ROBOTICS	ABB IRB 2600ID	ABB IRB 1660ID (smaller)	ABB IRB 4600 (higher payload)	KUKA KR-8
POSITIONER	ABB IRBP A750	No Positioner	ABB IRBP A500	
POWER SOURCE	Fronius TPS 500i CMT	Fronius iWave 500i AC/DC EWM Titan XQ R500 REACT	Lincoln Electric Miller	Kemppi ESAB
PRODUCTIVITY PACKAGE	Torch Service Station	Automatic Tip Charger	Advanced Productivity Dashboarding	Active Cooling*
WORKFLOW	MetalXL Suite			
CONTROL SYSTEM	MetalXL Control System	MetalXL 3D Scanner* Melt Pool Camera*	Acoustic Emission Sensor* Advanced Thermal Camera*	
MATERIALS	Standard Alloy Library	Titanium WAAM Upgrade*	Custom Specialty Alloys*	

: optional

M1 can be configured with the following brands:

MX3D continuously adds more brands, check www.mx3d.com for latest additions.

TECHNICAL SPECIFICATIONS

MX3D | M1 METAL AM SYSTEM

SYSTEM	System Footprint (wxdxh)	mm	2600mm (w) x 3000mm (d) x 3300mm (h)
	Access Door (wxh)	mm	2435mm (w) x 2500mm (h)
	Weight with Max. Part Weight	t	3.5
	Weight without Part	t	2.75
	Air Volume	m^3	5.2 (min) - 20.1 (max)
PRINT	Max. Print Volume (wxdxh)	mm	2200mm (w) x 1400mm (d) x 1700mm (h)
	Max. Table Payload	kg	750
	Max. Print Payload	kg	700
	Size Build Plate (wxdxh)	mm	1000mm x 1000mm x 38mm hardened steel octogonal shape / interchangeable
	Weight Build Plate	kg	250
	Clamping Thread Size	M	16
ROBOTICS	Robotic Axis	#	8
	Robot Accuracy	mm	max 0.5 (positional accuracy), max 0.02 (positional repeatability), max 0.3 (path repeatability)
	Robot Motion Speed	°/s	175 (J1-3), 360 (J4-5), 500 (J6), 90 (J7), and 150 (J8)
	Robot Motion Range	°	+180 to -180 (J1), +155 to -95 (J2), +75 to -180 (J3), +75 to -180 (J4), +175 to -175 (J5) and +120 to -120 (J6)
	Rotation Range Build Table	°	-360 to +360, up to infinite rotation neg/pos
	Swiveling Range Build Table	°	-180 to +180 (J8)
WELDING	Welding Transfer Modes	GMAW	MIG/MAG + CMT
	Input Voltage	V	3 x 380V (EU, country-specific voltage possible)
	Max. Input Current	A	3 x 380v --> 38.8A || 3 x 400v --> 37.5A
	Welding Current / Duty Cycle	A/%	10min/40°C: 500A / 40%, 430A / 60%, 360A / 100%
WORKFLOW	Control	OS	MX3D MetalXL-license
	Data/Signal Processing	fs	5,000+
	Interface	Inch	2x 21.5” Touch Screens + MetalXL (online/remote)
	CAD File Format	Format	.stl
LOCAL REQUIREMENTS	Power Connection	V	3 x 380 (EU), 3 x 400 (EU) or 3 x 460 (outside EU)
	Main Fuse Protection	A	3 x 40A slow blow
	Compressed Air	MPa	0.8 MPa / 8 bars
	Floor Loading	kN/m^2	5.7
	Min. Floor Space	m^2	4400mm (w) x 5000mm (d)


MX3D
MX3D

MX - METAL AM SYSTEM

For companies that want to print larger metal parts in-house, MX3D provides the custom **MX Metal AM System**. The MX is a turnkey robotic metal AM System for printing qualified metal parts fully tailored to customers' requests.

The MX Metal AM System includes an enlarged 8-axis heavy-duty industrial robot, high productivity power source and automation tools, all fully integrated with MX3D's MetalXL end-to-end workflow software and control system. It prints on multiple adjustable built plates simultaneously enabling autonomous 24/7 printing of qualified metal parts, where parts can weigh 5+ tons and measure upto 6 x 2 x 4 meters.

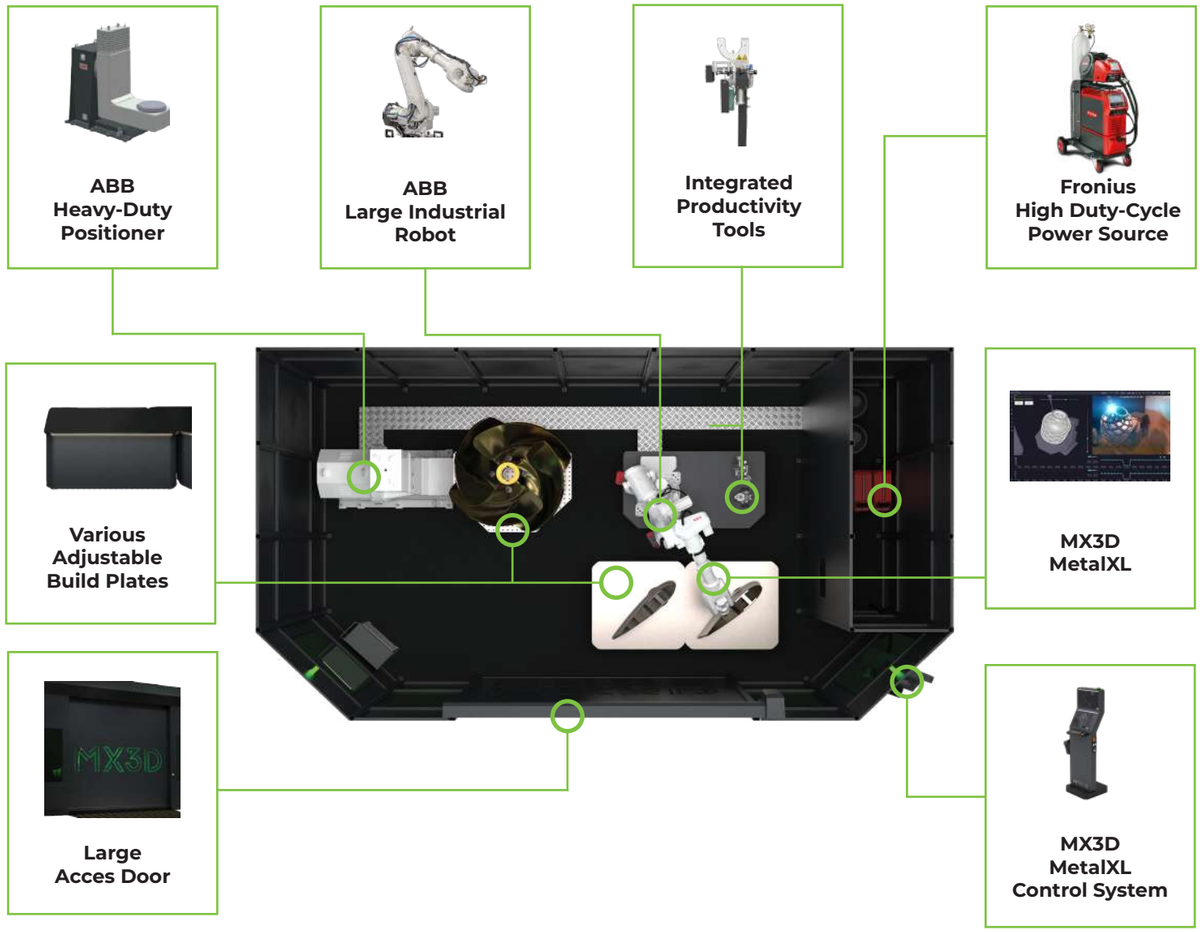
The MX Metal AM System is fully customizable to print your large-scale metal parts.

Utilizing renowned hardware from ABB / KUKA and Fronius / EWM, customers have a wide range of hardware options to configure the perfect system for printing large, heavy and customer metal components. The 8-axis robotic system can be fully optimized on reach, payload, force and accuracy, all integrated and automated by our MetalXL workflow platform and control system for flexible, controlled and advanced robotic 3D metal printing.

Due to its high level of robotic flexibility, automated productivity tools and integrated sensors system, the extended and heavy-duty MX Metal AM System runs autonomous 3D metal printing at an even faster speed, higher quality and larger volumes.



MX - CONFIGURATION

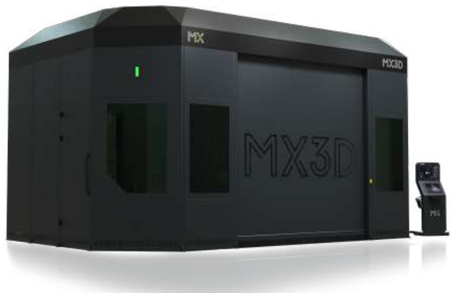


ADVANTAGES

- Enlarged robotic setup fully customizable to print your desired large-scale metal parts.
- Fully optimized extended 8-axis heavy-duty industrial robot to print up to 5+ tons and >2m in each dimension.
- High duty-cycle power sources to achieve high print speed up to 10 kg/hr, configurable for multi-alloy printing.
- Integrated productivity tools, advanced sensors and a control system to drive high print quality at high speed and control.

FULLY INTEGRATED WITH METALXL

- Full end-to-end workflow from design to print in one go, for various geometries on multiple build plates at high speed.
- Digital twin of the print for parameter optimization and component qualification.
- Add advanced sensors to expand monitoring and advance the closed-loop control system.
- Full traceability of the print process at high resolution in real-time complementary to components certification.





CONFIGURATION OPTIONS

ROBOTICS	ABB IRB 5700-series ABB IRB 6700-series - for higher payload ABB IRB 6700S-series - for extended reach	KUKA KR Quantec series KUKA KR Fortec series - for extended reach KUKA KR Titan series - for higher payload	
POSITIONER	ABB IRBP-iA 2-axis 1000kg ABB IRBP-iA 2-axis 2000kg ABB IRBP-iA 2-axis 4000kg	KUKA KP2-SV HW 2-axis 1100kg KUKA KP2-SV HW 2-axis 2600kg KUKA KP2-SV HW 2-axis 5000kg	Custom Positioner (for special higher payload or larger print dimensions)
POWER SOURCES	Fronius TPS 500i CMT - for advanced WAAM Fronius iWave 500i AC/DC CMT - for extra WAAM features Fronius TPSi Twin Wire Push - for higher deposition rate	EWM Titan XQ R 500 REACT - for advanced WAAM Other Welding Brands*	
PRODUCTIVITY PACKAGES	Torch Service Station	Automatic Tip Changer	Active Cooling*
WORKFLOW	MetalXL Suite	Custom Blueprint*	
CONTROL SYSTEM	MetalXL Control System	MetalXL 3D Scanner* Meltpool Camera* Thermal Camera*	Acoustic Emission Sensor* Active Cooling*
MATERIALS	Standard Alloy Library	Titanium WAAM Upgrade*	Custom Special Alloys*

*: optional

MX can be configured with the following brands:

MX3D continuously adds more brands, check www.mx3d.com for latest additions.

USER STORY

framatome

Framatome, the international leader in nuclear energy, has officially inaugurated a €25M and 6,000 m² Additive Manufacturing Center in France, the first industrial facility of its kind in Europe. Operating as a true factory powered by multiple **MX3D MX Metal AM Systems** for advanced robotic WAAM manufacturing, the center is dedicated to producing critical spare parts for French nuclear reactors and defense. Capable of manufacturing critical components from 1-ton impellers to massive 20-ton structures, this fleet of MX3D systems allows Framatome to meet the strictest nuclear safety requirements. By replacing traditional forging with large-scale WAAM technology, Framatome is actively slashing lead times, minimizing raw material waste, and securing its sovereign supply chain.



"This center stands as an essential lever to contribute to the performance of the nuclear sector, secure our supply chain, and reinforce our industrial sovereignty. Here, innovation takes shape and excellence is printed."

- Framatome



CONTROLLED INDUSTRIAL WAAM



TECHNICAL SPECIFICATIONS

MX3D | MX METAL AM SYSTEM

SYSTEM	System Footprint (wxdxh)	mm	9300mm (w) x 5300mm (d) x 4900mm (h)
	Access Door (wxh)	mm	3900mm (w) x 4000mm (h)
	Weight Net	t	8.3t
	Volume	m^3	240
PRINT 1 LARGE	Max. Print Volume (wxdxh)	mm	6000mm (w) x 1500mm (d) x 3600mm (h)
	Size Build Plate (wxdxh)	mm	6000mm x 1500mm x 38mm - hardened steel
	Max. Build Plates	#	6000mm x 1500mm
	Weight Build Plate	kg	750
	Clamping Thread Size	M	16
PRINT 2 COMPLEX	Max. Print Volume (wxdxh)	mm	2000mm (w) x 1800mm (d) x 2800mm (h)
	Max. Table Payload (incl. build plate)	kg	2000
	Max. Print Payload	kg	up to 2000
	Size Build Plate (wxdxh)	mm	2000mm x 2000mm x 58mm - hardened steel - octagonal shape / interchangeable
	Weight Build Plate	kg	500
	Clamping Thread Size	M	16
ROBOTICS	Robotic Axis	#	8
	Robot Accuracy	mm	max 0.75 (positional accuracy), max 0.02 (positional repeatability), max 0.9 (path repeatability)
	Robot Motion Speed	°/s	100 (J1), 90(J1-2),170 (J4),120 (J5),190 (J6),
	Robot Motion Range	°	+220 to -220 (J1), +85 to -65 (J2), +70 to -180 (J3), +300 to -300 (J4), +130 to -130 (J5) and +360 to -360 (J6)
	Rotation Range Build Table	°	-360 to +360, up to infinite rotation in both directions (J7)
	Swiveling Range Build Table	°	-180 to +180 (J8)
WELDING	Welding Transfer Modes	GMAW	MIG/MAG + CMT
	Input Voltage	V	3 x 380V (EU, country-specific voltage possible)
	Max. Input Current	A	45A - before transformer
	Welding Current / Duty Cycle	A/%	10min/40°C: 600A / 40%, 520A / 60%, 430A / 100%
WORKFLOW	Control	OS	MX3D MetalXL-license
	Data/Signal Processing	fs	5,000+
	Interface	Inch	2x 21.5” Touch Screens + MetalXL (online/remote)
	CAD File	Format	.stl
LOCAL REQUIREMENTS	Power Connection	V	440V
	Main Fuse Protection	A	3 x 63A slow blow
	Compressed Air	MPa	0.8 MPa / 8 bars
	Floor Loading	kN/m^2	Depends on weight of the largest desired print. Calculation: (max. print weigh in kg * 9.80) / 5 (weight / surface)=Kn/m^2

MD - METAL AM SYSTEM

For industries requiring localized production in remote environments, MX3D offers the **MD Metal AM System**. The MD is a rapidly relocatable WAAM micro-factory housed in a standard shipping container, ready for immediate transport by truck, rail, or ship. Engineered for operational readiness, this ruggedized industrial setup serves as a shippable autonomous factory, enabling remote field operations.

The MD Metal AM System empowers a mobile production hub to achieve local supply chain sovereignty. By enabling on-demand, localized 3D metal printing, it bypasses global supply lines and cuts lead times from months to weeks or even days.

The system is available with an expandable roof, enabling a larger print volume of 2,100mm (w) x 1,400mm (d) x 1,500mm (h), capable of producing complex components up to 750kg.

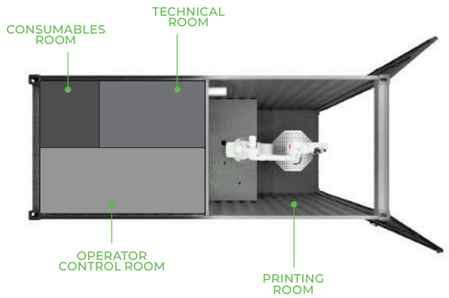
Powered by an optimized 8-axis robotic setup and a multi-transfer power source, the MD Metal AM System prints any weldable alloy at high deposition rates. Integrated with MX3D's MetalXL workflow and supported by automation tools, it ensures continuous productivity for rapid manufacturing, repair, and overhaul on-site.



MARITIME
Metalworks on Harbor Site

CONTROLLED INDUSTRIAL WAAM





	STANDARD	CONFIGURATION OPTIONS
SYSTEM SIZE	20ft Container 6,200mm (w) x 2,440mm (d) x 2,600mm (h)	Compact 10ft Container 2,990mm (w) x 2,440mm (d) x 2,590mm (h)
ROBOTICS	8-Axis ABB 2600 Omnicore, incl. 750kg Manipulator Optimized Mounting System	
POWER SOURCE	Fronius TPS 500i CMT	Fronius iWave 500i AC/DC EWM Titan XQ R500 REACT
AUTOMATION	Automatic Torch Service Station Automatic Torch Calibration Automatic Tip Changer	
WORKFLOW	MetalXL Suite	MetalXL On-Premise
CONTROL SYSTEM	MetalXL Control System Touch-Screen UI	
ADD-ONS	MetalXL 3D Scanner (for repair/hybrid) Active Cooling Kit	Thermal Camera Melt Pool Camera Acoustic Emission Sensor
UTILITIES	Integrated Air, Fume & HVAC	
LOCAL REQUIREMENT	Generator or Power Supply	
MATERIALS	Any Weldable Alloy	

MD can be configured with the following brands:

MX3D continuously adds more brands, check www.mx3d.com for latest additions.

POINT-OF-NEED WAAM

The **MD Metal AM System** is perfectly suited for metal works of new prints, repairs, and maintenance in highly remote and challenging environments, including:

DEFENSE
On-site Print/Repair Hub



OFFSHORE ENERGY
On-site Repair Platform



SCIENCE
Metalworks on Expedition Vessel



MINING
Local Weld Factory



MB - METAL AM SYSTEM

For companies looking to integrate robotic 3D metal printing into an existing manufacturing facility MX3D introduces the **MB Metal AM System**. Soon to be released, the MB is a WAAM system that provides a streamlined, highly cost-effective alternative to fully enclosed turnkey units. Built on the reliable foundation of our flagship M1, it delivers advanced WAAM on a simplified, ready-to-ship platform.

The MB is built with the essential hardware. It operates without the spatial restrictions of standard closed machine guarding. This gives manufacturers the freedom to configure their envelope, accommodating large-scale parts.

The system provides the core essentials required to start printing immediately: an industrial 8-axis robot and a Fronius power source, paired with a license for MX3D's proprietary MetalXL software. This ensures you get an effective WAAM hardware system, combined with the complete software intelligence to manage the entire workflow from CAD to print in one go.

AVAILABLE IN 2027



CONFIGURATION OVERVIEW
MX3D | M-METAL AM SYSTEMS

SYSTEM	M	MX	MD	MB
PURPOSE	Complex medium-to-large parts manufacturing	Heavy-duty large-scale parts manufactring	Relocatable metal parts manufacturing	Foundational metal parts printing
CONFIGURATION	Best turnkey system	Fully customized system to customer specs	Deployable ruggedized system	WAAM essentials system
STRENGTHS	Preferred WAAM system	Largest WAAM system	Deployable WAAM system	Fundamental WAAM System
PRINT VOLUME	Large for its class (2,200 x 1,400 x 1,700mm)	Customizable to very large (>2,000mm in each dimension)	Large within container box (2,100 x 1,400 x 1,600mm)	Large for its class (2,200 x 1,400 x 1,700mm)
PRINT WEIGHT	Up to 750kg	From 1,000 to 20,000kg	Up to 750kg	Up to 750kg
ROBOTICS	Optimized 8-axis robotics	Expanded, high-payload robotics, incl. multi-robot system (>12-axis)	Optimized 8-axis robotics	Optimized 8-axis robotics
WELDING	Advanced GMAW power source	Heavy-duty GMAW power source	Advanced GMAW power source	Optimized GMAW power source
SYSTEM INTEGRATION	Fully integrated with MX3D MetalXL	Custom integration with MX3D MetalXL	Fully integrated with MX3D MetalXL (on-premise)	Fully integrated with MX3D MetalXL (on-premise)
SOFTWARE	MX3D MetalXL (CAM + LIVE + VIZ)	MX3D MetalXL (CAM + LIVE + VIZ)	MX3D MetalXL (CAM + LIVE + VIZ)	MX3D MetalXL (CAM + LIVE + VIZ)
CONTROL SYSTEM	MetalXL Control System	MetalXL Control System	MetalXL Control System	MetalXL Control System
PRINT CONTROL	Advanced, real-time, fully traceable	Advanced, real-time, fully traceable	Advanced, real-time, fully traceable	Advanced, real-time, fully traceable
ADD-ONS	Optionally available	High automation included, others available	MetalXL 3D Scanner included, others available	Optionally available
MATERIAL RANGE	Any weldable alloy and multi-wire	Any weldable alloy and multi-wire	Any weldable alloy and multi-wire	Any weldable alloy
INDUSTRIES	All industries	Heavy-duty industries	Remote, offshore, and local industries	SME metal facilities
SYSTEM FOOTPRINT	2,600 x 3,000 x 3,300mm	Large (>3,000mm all dimensions)	20ft or 10ft ISO Container	Adaptable to customer facility
CERTIFICATION	CE-marked, Machinery Regulation (EU) 2023/1230	CE-marked, Machinery Regulation (EU) 2023/1230	CE-marked, Machinery Regulation (EU) 2023/1230	CE-marked, Machinery Regulation (EU) 2023/1230

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