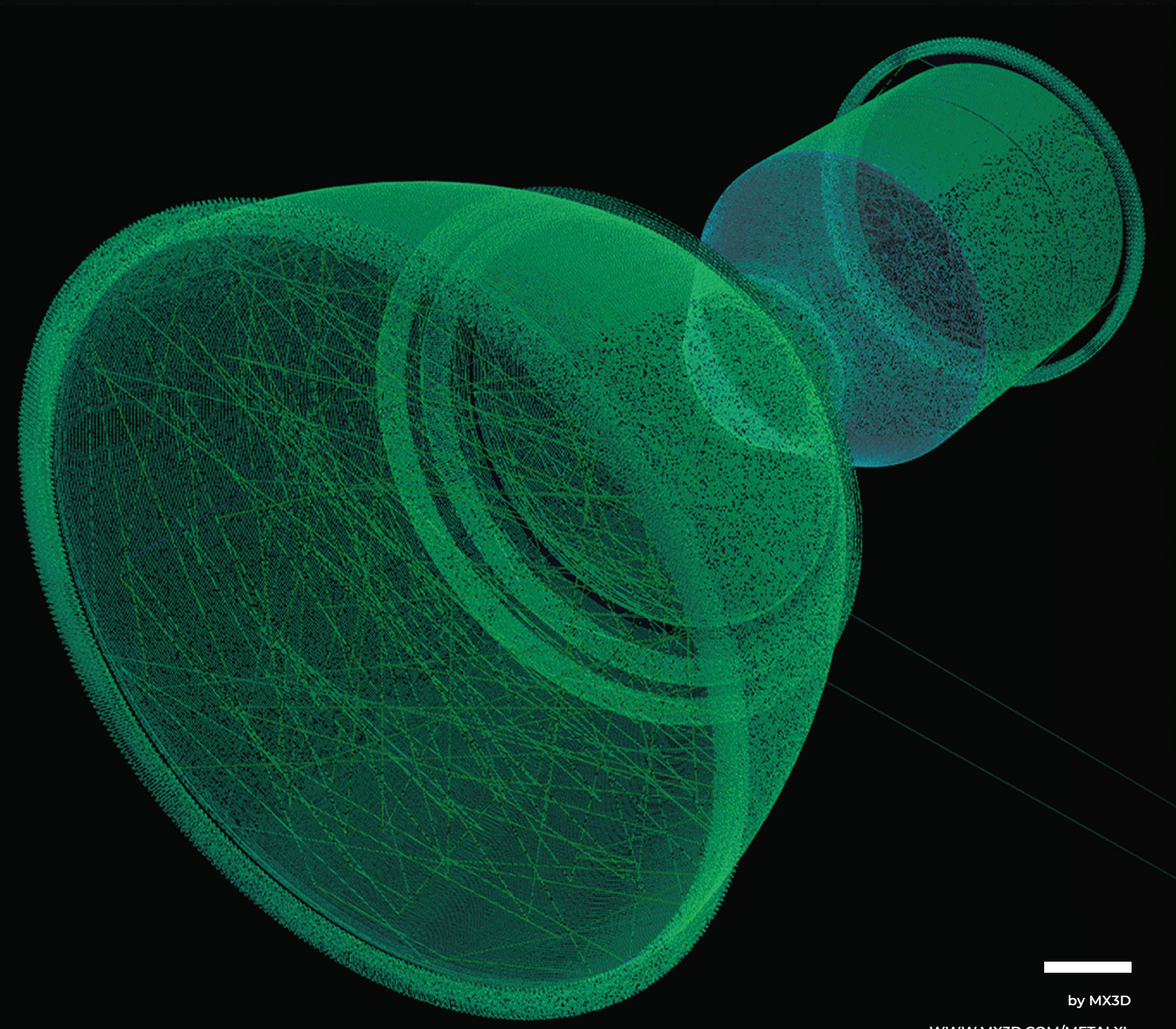
METALXL

3D METAL PRINTING SOLUTION

ROBOTIC WIRE ARC ADDITIVE MANUFACTURING



by MX3D

WWW.MX3D.COM/METALXL

METAL XL

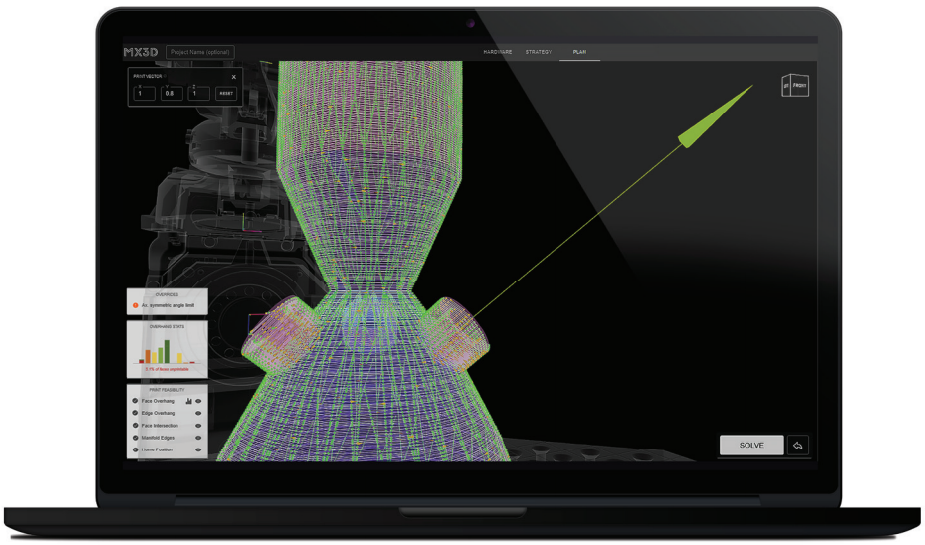
MetalXL is built by MX3D to enable 3D metal printing of large metal parts in-house, using robotic WAAM technology (Wire Arc Additive Manufacturing).

MetalXL is integrated to an off-the-shelf industrial robot and power source and transforms it into an industrial-grade 3D metal printer.

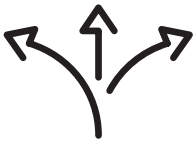
Its streamlined end-to-end workflow allows our users to easily manage the whole printing process from design to print, including data monitoring, logging and analytics.

MetalXL is independent of hardware configuration and easy to use. It offers diverse features to both print with preset metal alloys and process parameters, or customize the entire process to your own needs.

MetalXL: dedicated WAAM solution from CAD to print in one go



BENEFITS

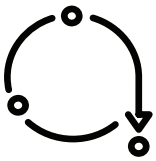


FLEXIBILITY

MetalXL can be connected to a simple 6-axis robot, or an 8-axis system including an external positioner for increased geometry freedom on complex shapes production.

SPEED

MetalXL enables customers to start-up 3D metal printing fast and at lower costs by combining a standard industrial robot and power source.



END-TO-END

MetalXL is a dedicated tool for WAAM technology that can go from design to print, data logging and process analytics in one workflow.

EASY TO USE

Fast adoption due to advanced automation requiring only basic engineering skills to operate.

INTELLIGENT AUTOMATION

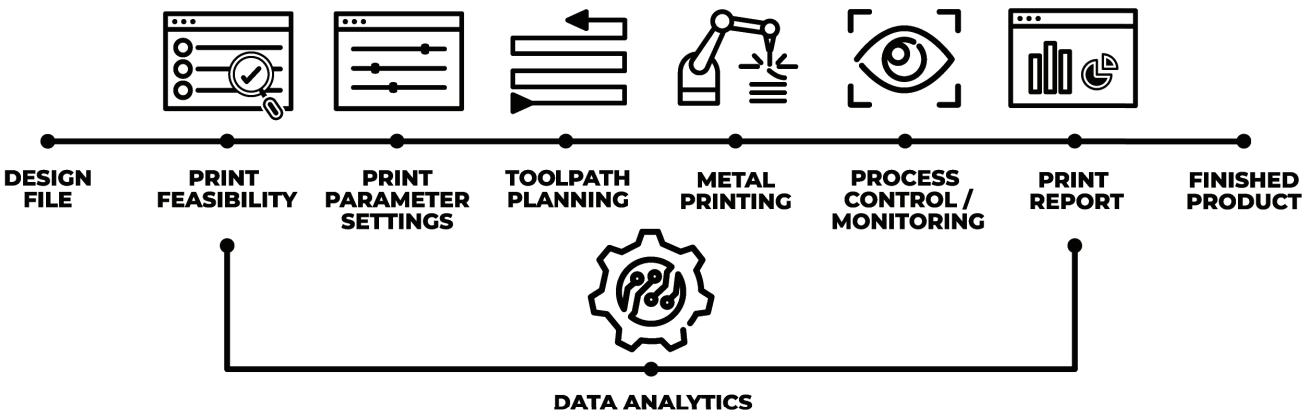
Built-in checks on the feasibility of the design and advanced robot kinematics simulation ensure a printable, optimized toolpath.

CONTINUOUS MONITORING

User interface that allows you to track the progress and quality of the print process live and to monitor events and issues during printing.

WORKFLOW

MetalXL is a WAAM-dedicated solution by MX3D that gets users through the complete additive manufacturing workflow, from design to print in one go. The MetalXL CAM software allows users to select the printing material and strategy, assess print feasibility and create the toolpath plan. MetalXL includes a hardware control system equipped with multiple sensors and interfaces for print monitoring, key parameters logging, and 3D visualization of the printing data.



MetalXL is compatible with
(non-exhaustive)

MX3D continuously adds more compatible brands.
Please check with metalxl@mx3d.com on the compatibility with your hardware configuration.

MetalXL Control System

KEY FEATURES

- **Built-in metal alloy library** including verified WAAM process parameters for various applications and certified strategy pre-sets based on extensive testing.
- **Customize the print process to your needs** and add your metal alloys and specific parameters via the **automatic calibration tool.**
- **Multiple printing strategies for diverse metal alloys**, ranging from single wall, multi-wall and diverse solid infill strategies, each including specific parameter settings.
- **Compatible with 6-Axis or 8-Axis setup**, enabling users to print with more freedom due to the connected 6-axis robot and a 2-axis positioner.
- **Enhanced productivity and consistent material performance** thanks to dynamic interpass time driven by a **temperature sensor.**
- **Continuous monitoring and simulation** of the printing process with real-time feedback to the operator by the **MetalXL Control System** (shown right) including key welding parameters and automated failure detection.
- **Real-time control and feedback** to the operator on the print performance, including live simulation, parameter tracking, and built-in event management tool.
- **3D-visualization tool** on key printing parameters for improved insights into the printing process.
- **High-resolution data logging of the print data** for advanced documentation, analysis, validation of print quality and parameter's refinment.

CAM INTERFACE

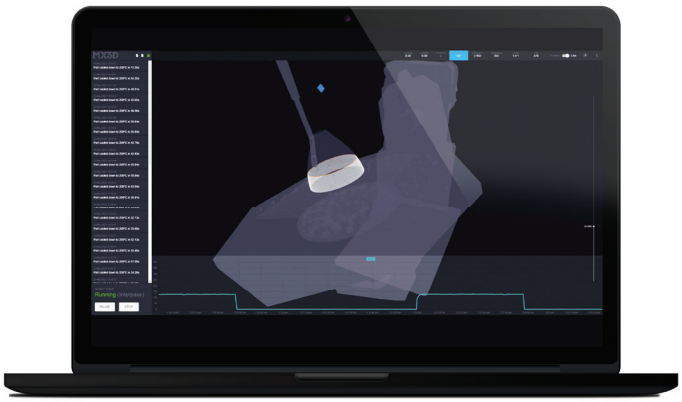
1. Select Strategy: MetalXL includes a library of alloys and associated parameter sets, based on MX3D's extensive experience and projects. Users can also upload their own alloys in the interface, and alter each parameter manually to fit their use case's requirements.

2. Check feasibility: MetalXL performs feasibility checks (e.g. overhangs mesh issues, eg.) to determine potential problems before printing the current design. Based on a review of these checks, the design can be altered.

3. Plan toolpath: after positionning the object(s) on the printing plate, chose your alloy, printing strategy and parameters to slice the part and create the toolpath.

This toolpath can be simulated and previewed prior to starting the printing process.

4. Print object: when the toolpath is approved, the printing can start. The print progress and productivity KPIs can be tracked live via MetalXL.



MATERIALS

MetalXL can be used for every weldable alloy, and is successfully used for (non-exhaustive):

Stainless Steels:

308LSi: EN ISO 14343 – A: 19.9LSi

316LSi: EN ISO 14343 - A: 19.12.3LSi

Duplex ER2209 : EN ISO 14343 - A: 22.9.3NL

Carbon Steels:

G3Si-1 : EN ISO 14341-A: G 3Si1

G4Si-1 : EN ISO 14341-A: G 4Si1

Aluminium:

5356: EN ISO 18273: S Al 5356 (AlMg5Cr(A))

5183: EN ISO 18273: S Al 5183(AlMg4,5Mn0,7(A))

4018: EN ISO 18273: S Al 4018 (AlSi7Mg)

4046: EN ISO 18273: S Al 4046 (AlSi10Mg)

High-Strength Steels:

NiMo: EN ISO 16834-A: G Mn3Ni1Mo

NiCrMo: EN ISO 16834-A: G Mn3Ni1CrMo

Bronze:

CuSn6: EN ISO 24373: Cu 5180A

CuSi3 : EN ISO 24373: S Cu 6560

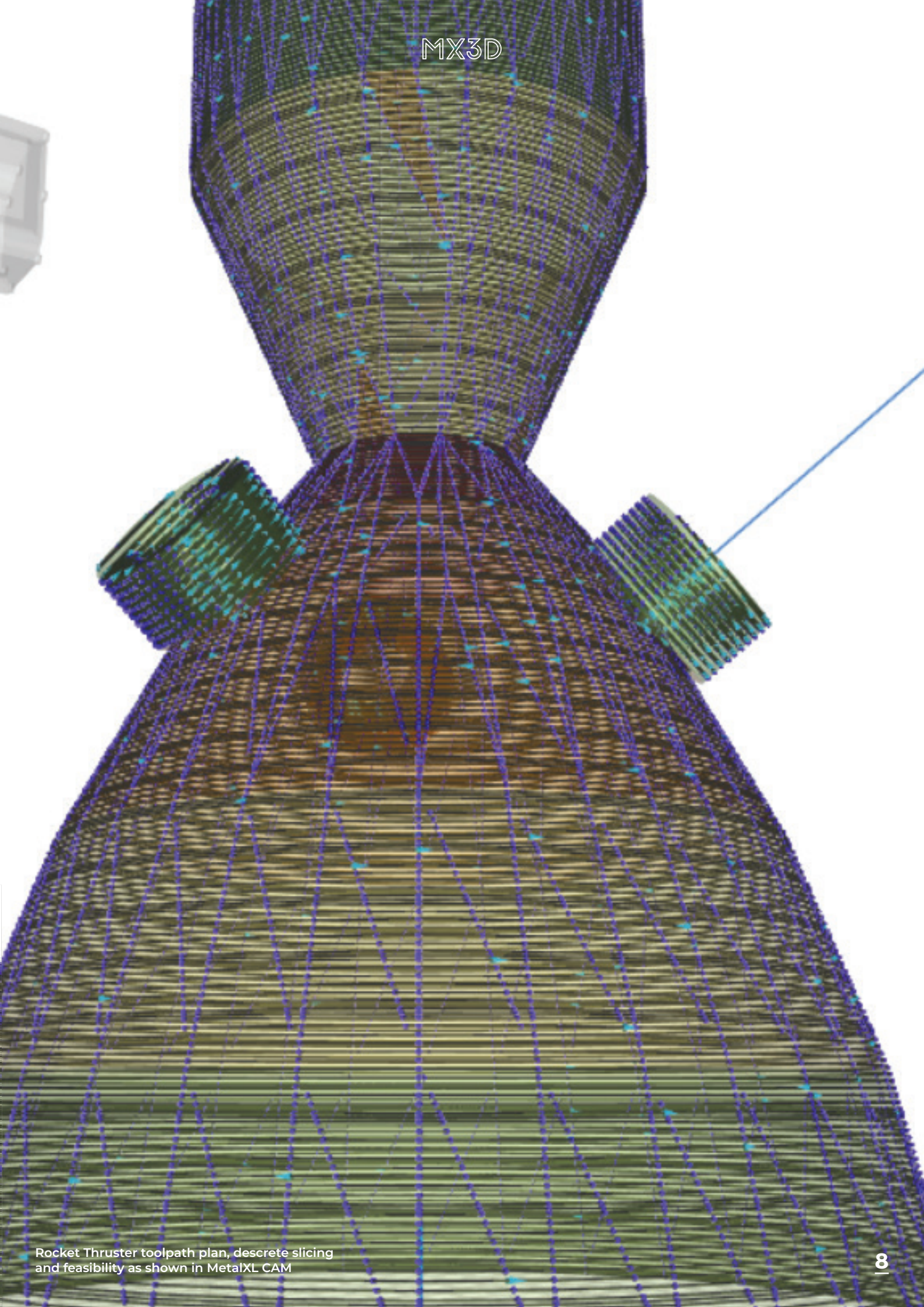
CuAl8: EN ISO 24373: S Cu 6100

CuAl8Ni6: EN ISO 24373: S Cu 6328

Inconel:

Ni625

Ni718



Rocket Thruster toolpath plan, descrete slicing and feasibility as shown in MetalXL CAM

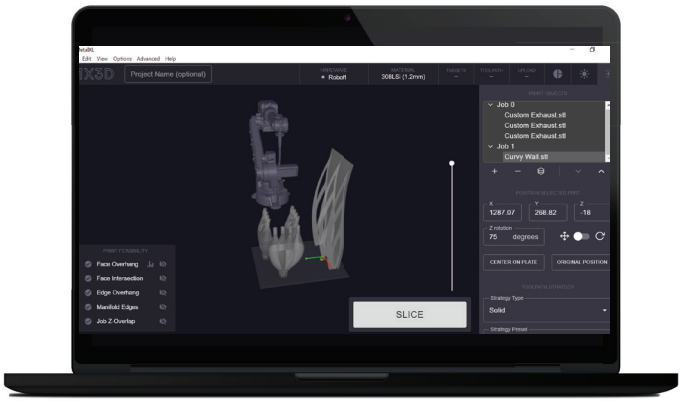
ADVANCED STRATEGIES

MetalXL includes various printing strategies, including single walls, multi-walls, and different solid infills. These strategies allow users to easily start printing with existing presets, but also customize these strategies for their own needs and use cases.

- **Overhang management and multi-direction discrete slicer**

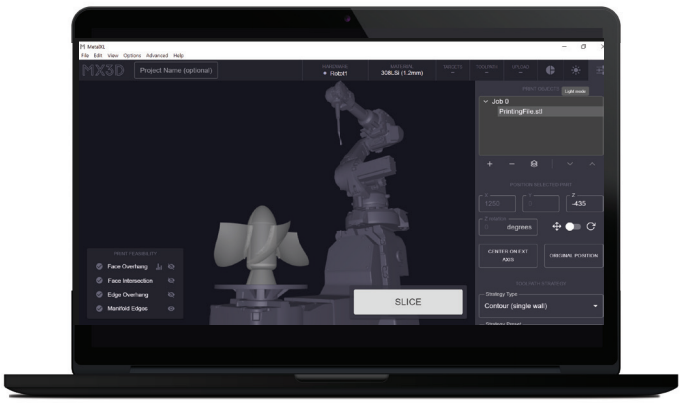
More than a regular 3D printing slicer, MetalXL includes WAAM-dedicated parameters and automated steps to improve the process and print quality. Our dedicated algorithms allow you **up to 45˚ overhangs** without an external manipulator, and **increased freedom of geometry** when working with an 8-axis setup.

Once connected to a robotic setup including an **external positioner (6+2 axis**), MetalXL allows users increased freedom of geometry thanks to multi-axial slicing. The use of an 8-axis system allows users to **print in multiple directions**, leading to advanced manufacturing capabilities and component optimization.



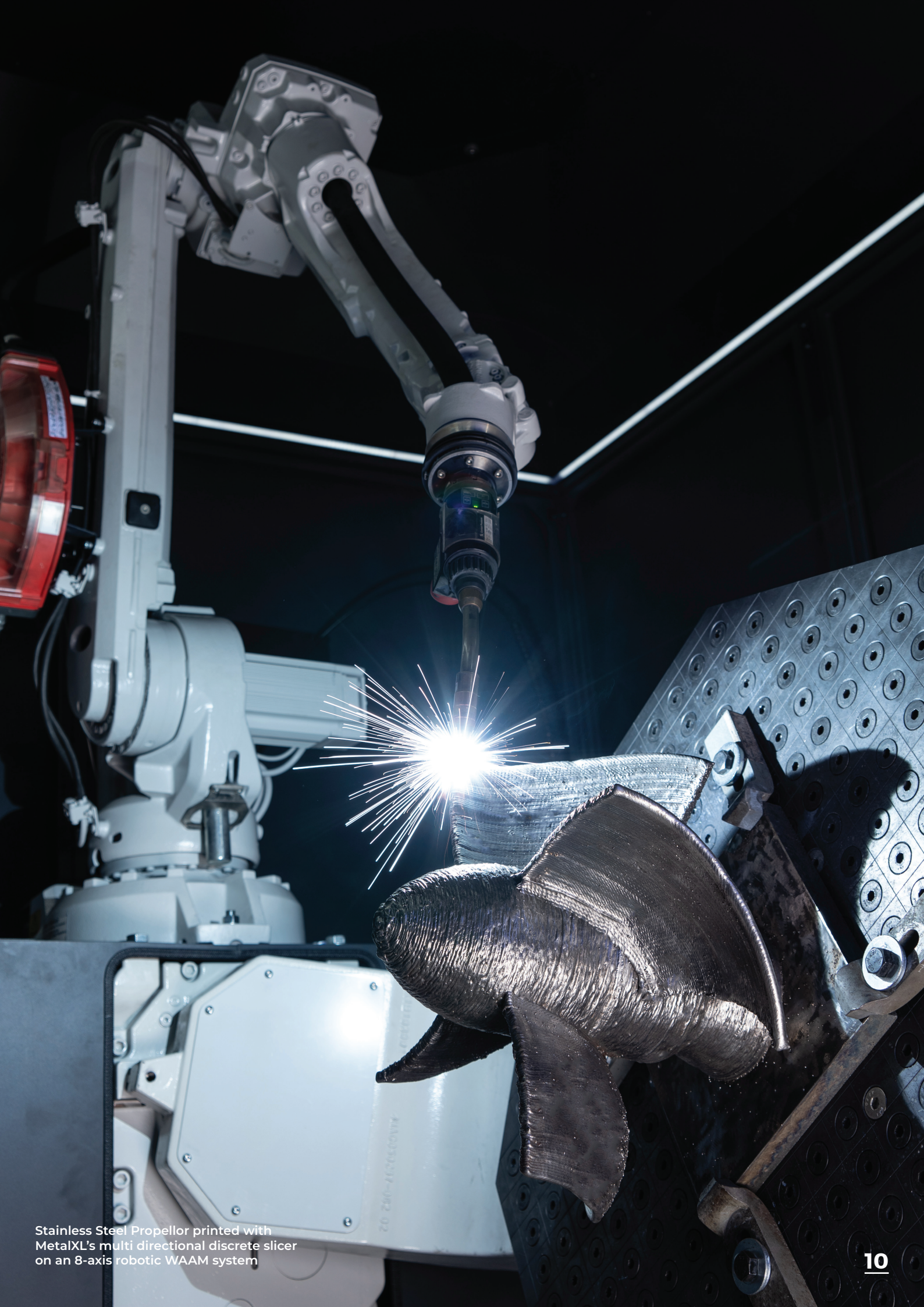
- **Print multiple objects**

MetalXL allows for printing several objects on the build plate simultaneously. This improves productivity by **increasing the printing/ waiting time ratio**. Users can now print serial-batches of similar geometries or simultaneously print various objects on the same build plate.



- **Combine multiple printing strategies**

By allowing users to set up a multi-strategy printing workflow in advance, it no longer requires human assistance to manually change parameters during the process. This is now automated, further increasing process productivity.



Stainless Steel Propellor printed with MetalXL's multi directional discrete slicer on an 8-axis robotic WAAM system

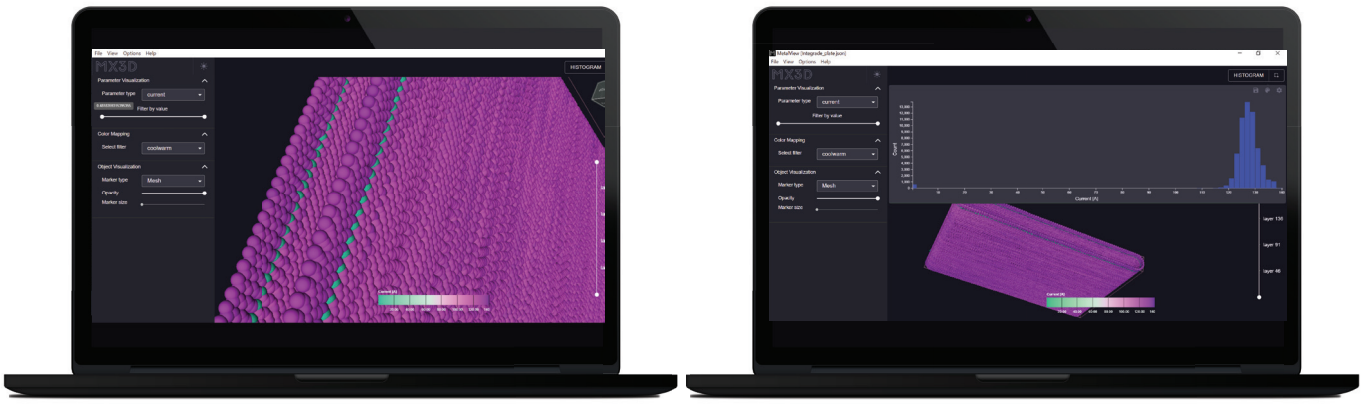
MONITORING AND ANALYTICS

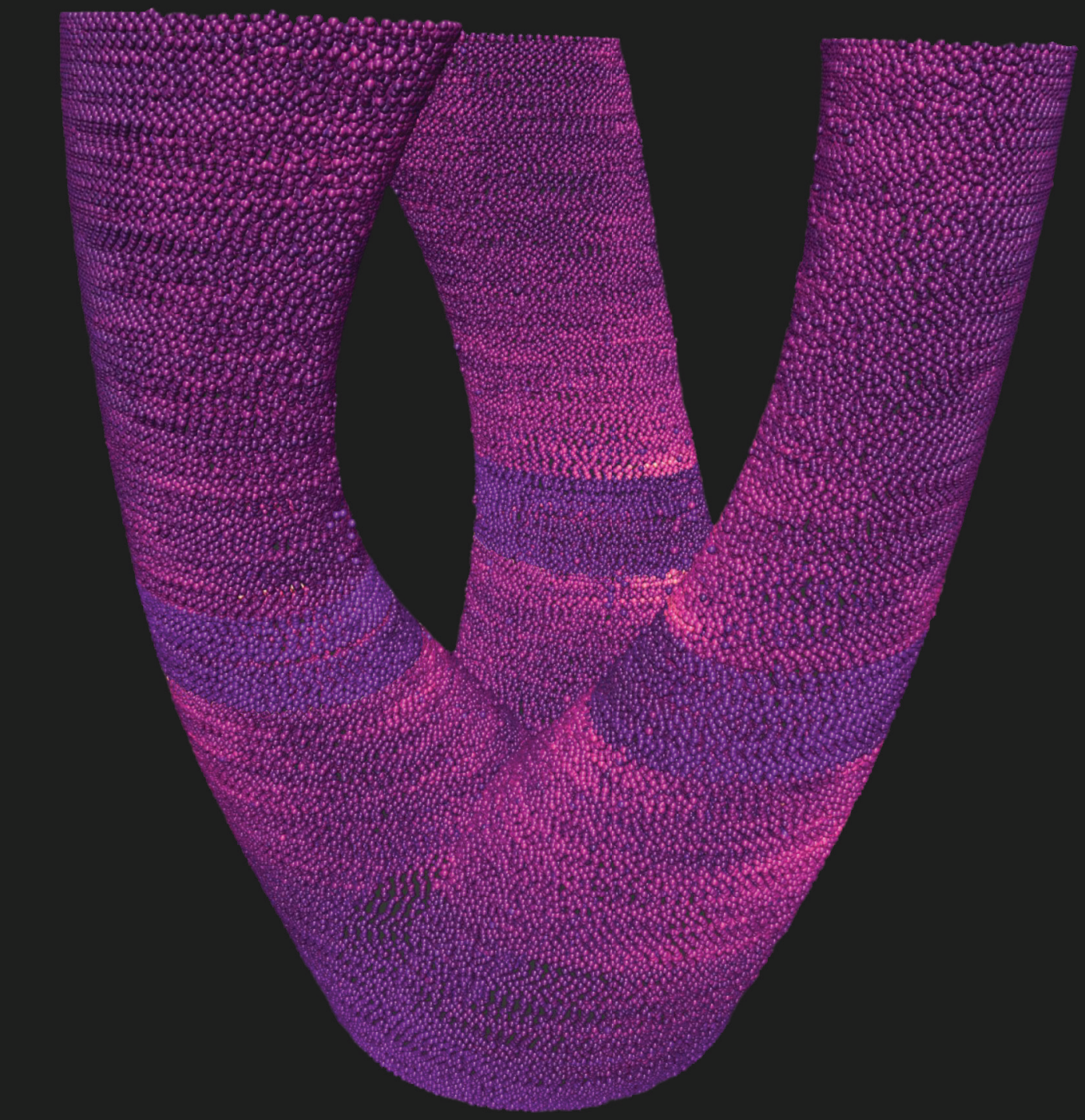
MetalXL includes a hardware control system for print monitoring and data logging. Thanks to the connected sensors, including current, voltage, and temperature, users can follow the printing process and track parameters in real-time in **MetalXL Live**.

By logging up to 5,000 samples per second on key print parameters, a 3D print report is created after the process, allowing visualization of the logged data at each point of their print in **MetalXL Viz**.

MetalXL Live - Real-time data collection of voltage, current and cooling time

MetalXL Viz - 3D visualisation of the logged key welding parameters



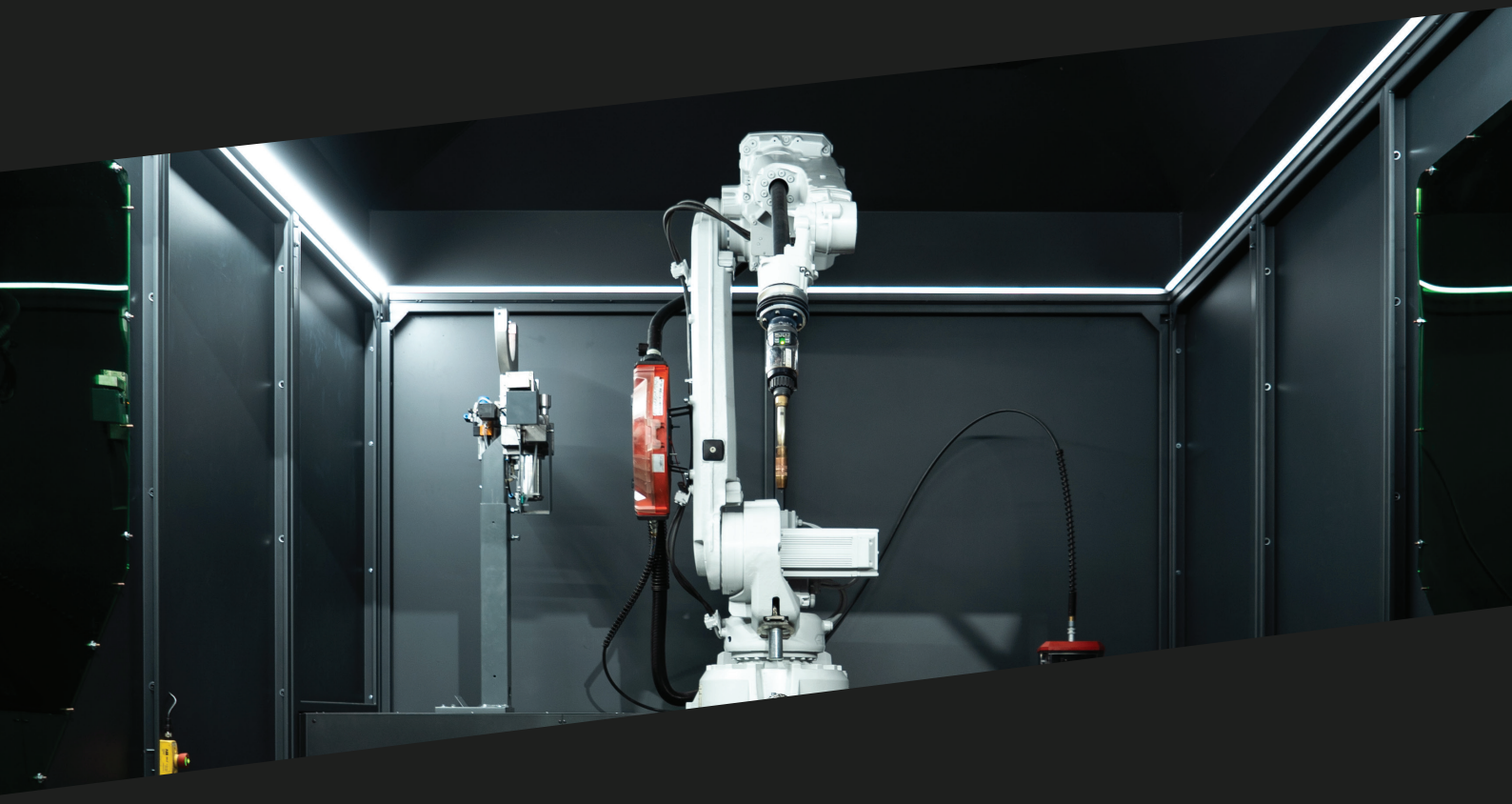


3D-visualization of print measurements

DYNAMIC INTERPASS TIME

The **MetalXL Control System** incorporates a dynamic interpass time tool, driven by a pyrometer, measuring the temperature of the top layer. Because WAAM is based on the superposition of welding layers, controlling the temperature through the process is key to get the desired material microstructure and properties.

Next to achieving quality prints, MetalXL enhances productivity by automatically printing the layers at the desired temperature.



MATERIAL CALIBRATION

MetalXL includes a library of pre-set parameters and strategies for various materials, based on research and MX3D's experience.

An optional laser scanner offers the possibility to automatically calibrate any alloy, in order to get an optimal parameter set to start printing with WAAM.

From there, users easily get a starting point to use their custom materials with WAAM and refine the parameters according to the requirements of the application.

Stainless Steel Mold printed
with MetalXL by MX3D

CUSTOMER CASE

FORCE Technology, an international technology consulting company, has selected MetalXL to upgrade its robotic WAAM setup. It is one of the largest 3D metal printers in Scandinavia.

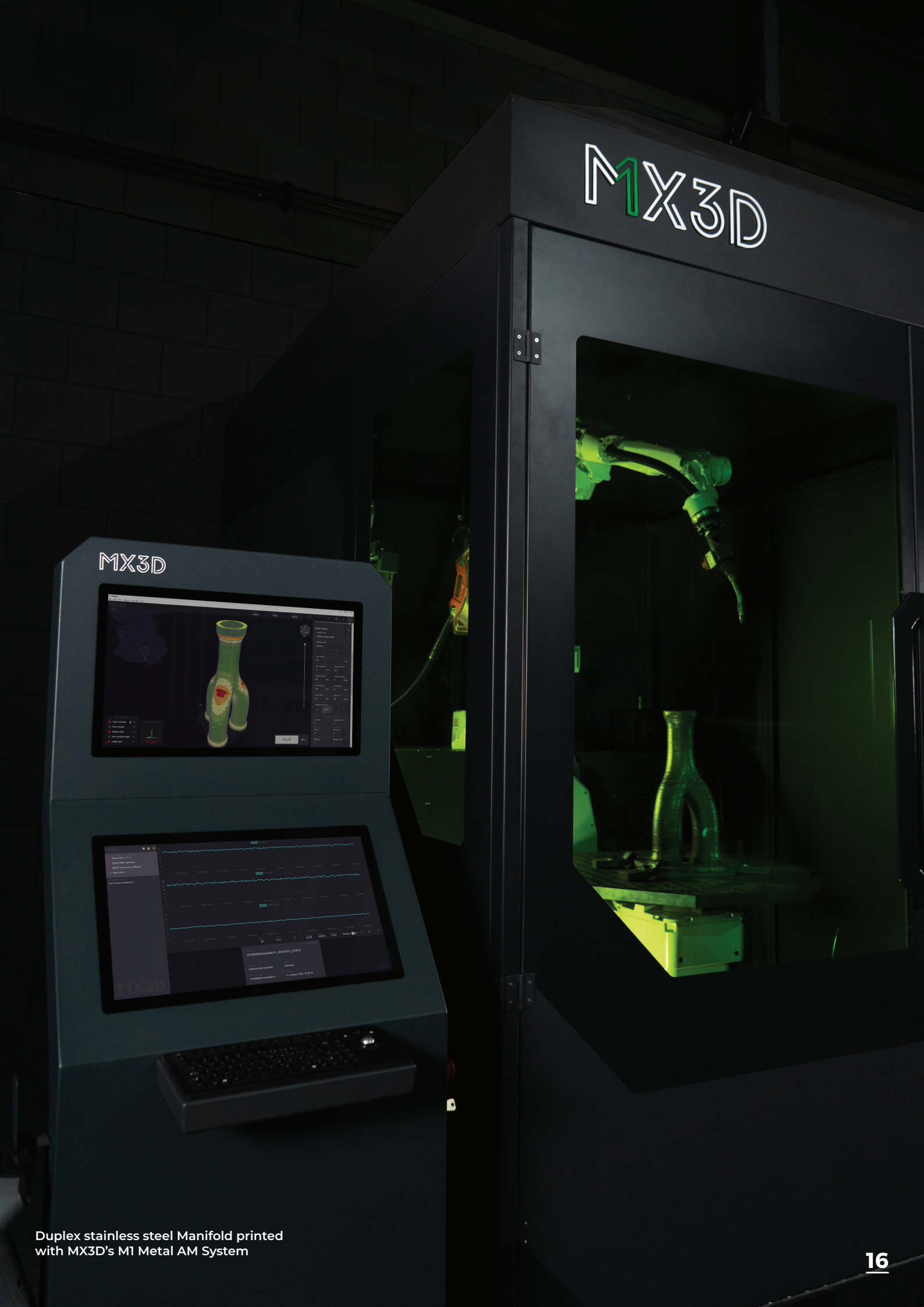
MetalXL now enables them to produce large-scale metal parts with increased geometric freedom for research and commissioned projects.

Click the following link for more information.

FORCE Technology using MetalXL

"The largest metal 3D-printer in Scandinavia has been upgraded with MetalXL enabling the printer to produce unique designs by melting a metal wire using a standard welding technique."

Peter Tommy Nielsen, Head of Department, 3D Print & AM Technology, FORCE Technology



Duplex stainless steel Manifold printed with MX3D's M1 Metal AM System

MX3D

T: +31 20 737 24 50
E: metalxl@mx3d.com
W: www.mx3d.com/metalxl