

Vipra aimTM

**Turnkey Robotic WAAM Platform
for Metal Parts Production**

CARACOL

BUILD BEYOND POSSIBLE

with Advanced Robotic Manufacturing

Caracol is a leader in advanced manufacturing, developing robotic platforms for complex industrial production with composites and metals.

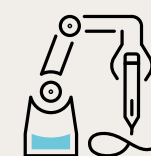
Application-first approach

Since 2015, Caracol has built its tech around one principle: provide the tools for companies to solve their real production needs, so they can produce complex, high-performance applications while cutting costs, lead times, waste, and providing greater flexibility in their parts engineering and value chains.

The company's mission is to change the manufacturing paradigm, making it more efficient, flexible, and sustainable.

Print faster, print stronger with Vipra AM

Vipra AM is Caracol's robotic platform for the production of parts with metal alloys. Built for industrial applications that demand high performance at scale, with no compromises on strength, speed, or quality.



Flexibility

complex designs and geometries, structural, monolithic parts with no assemblies.



Efficiency

optimized lead times, lower costs, up to 90% buy-to-fly ratio, with industrial quality.



Quality

high-strength, high-integrity parts with demanding specifications.

An Ecosystem to Enable Advanced Manufacturing

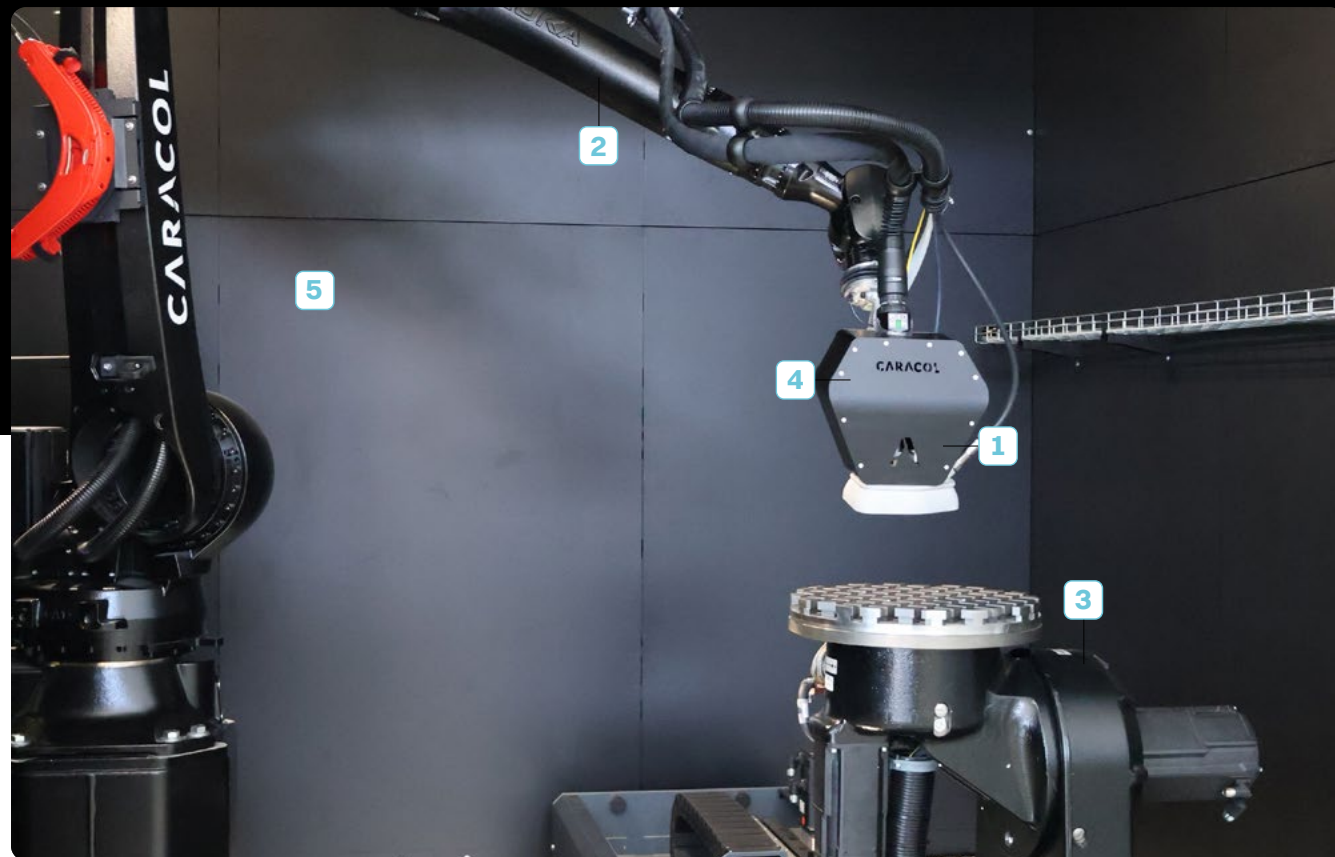
We provide our metal technology with a fully integrated ecosystem of tools to enable industrial production: hardware, software, materials, process and application knowledge. A single provider, for all needs, and an industrialized set of ingredients for your manufacturing needs.

This provides what individual parts of the tech cannot:

- A complete, proven production environment to adopt, scale, and rely on;
- Less integration work, faster time to production;
- One partner to support you, from part engineering to production.

Robotic Turnkey Platform

Vipra AM is a turnkey platform for advanced industrial production.



- 1 DEPOSITION HEAD
- 2 ROBOTIC ARM
- 3 EXTERNAL MANIPULATOR & LINEAR TRACK
- 4 SENSORS
- 5 EIDOS MANUFACTURING SOFTWARE SUITE*
FUME EXTRACTOR*
WELDING POWER SOURCE*
CONTROL CABINET*

*on the back, in a dedicated area
separate from the robotic cell

up to **95%**
LEAD TIME REDUCTION

up to **90%**
BUY-TO-FLY RATIO

1. Deposition Head

Vipra XP model leverages CMT (Cold Metal Transfer) technology, to maximize productivity and process efficiency, and minimize operating costs.

This transformative process in Wire Arc Additive Manufacturing (WAAM) integrates advanced welding techniques with good process control for the efficient, layer-by-layer production of metal structures. CMT operates with a low-heat input, intermittently feeding the wire into the molten pool through a synchronized short-circuiting arc, ensuring both accuracy and efficiency.

Benefits

- Maximized output and minimized costs, for enhanced productivity and reduced lead times.
- Low-heat to preserve material integrity, reduces distortions, and guarantees part mechanical strength.
- Clean, precise deposition with minimal spatter for consistent high-quality prints.
- Built-in anti-collision system to prevent damage to machine and ensure structural integrity of part.

Applications

Vipra AM is ideal for producing large-scale parts across various industries, including aerospace, automotive, architecture, and railways.

It is particularly well-suited for spare parts production, repair work, cladding, and tooling, offering the flexibility and performance needed for demanding industrial applications.

2. Robotics

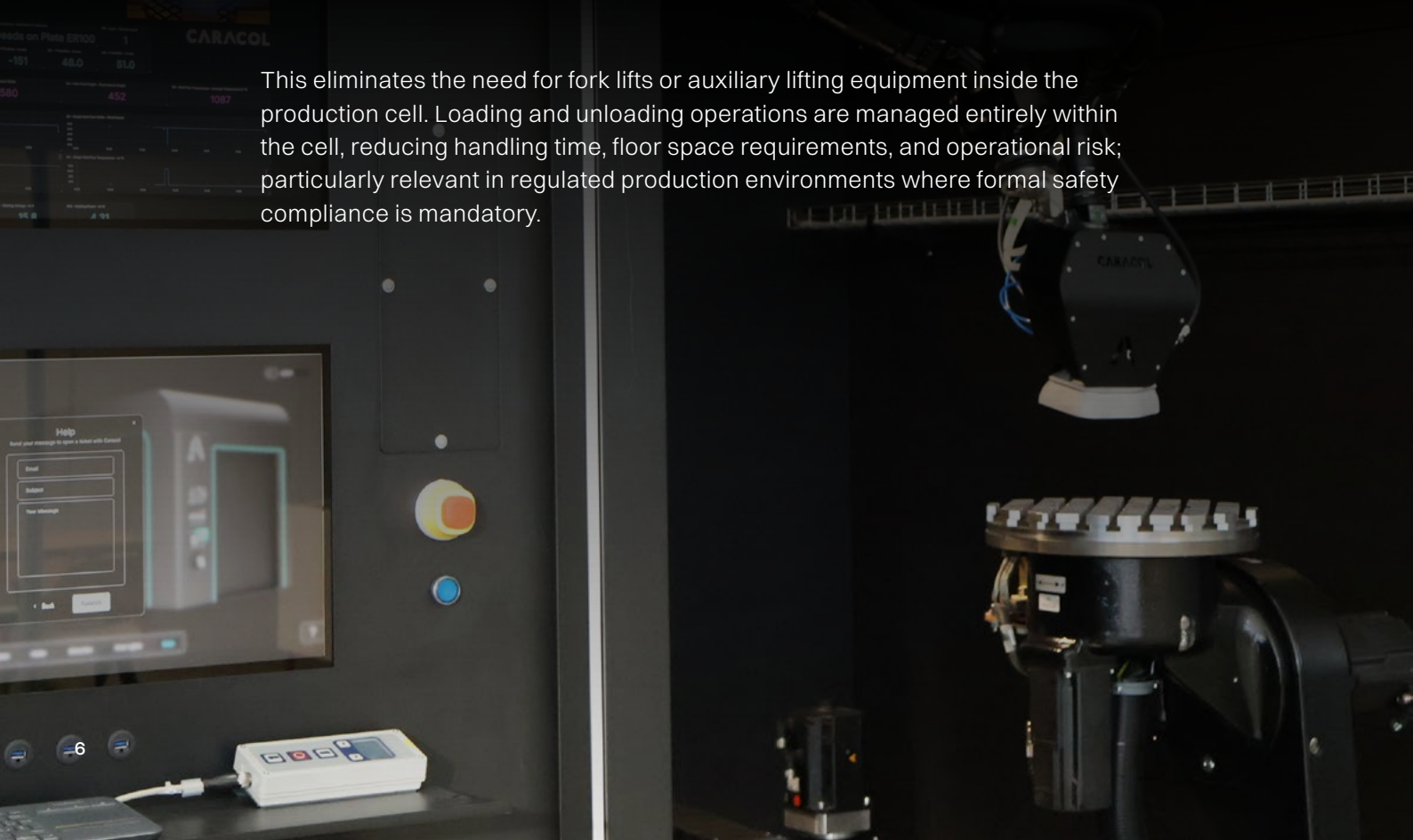
Vipra AM is built around a high-payload industrial robot operating on a 9-axes architecture, one axis beyond the standard configuration of most WAAM platforms, designed to simplify handling of large-scale metal components in the shop floor.

The additional axis extends the robot arm and external manipulator’s kinematic range, enabling greater freedom of movement and more accurate torch positioning across complex geometries. This translates directly into consistent deposition quality throughout the build, regardless of part size or shape.

3. External manipulator & linear track

Vipra AM integrates an external linear track as the ninth axis of the system, functioning as a static pre-positioning slide that extends the robot’s working range along a defined linear path.

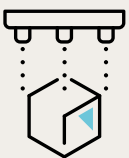
This eliminates the need for fork lifts or auxiliary lifting equipment inside the production cell. Loading and unloading operations are managed entirely within the cell, reducing handling time, floor space requirements, and operational risk; particularly relevant in regulated production environments where formal safety compliance is mandatory.



4. Sensors

Vipra AM integrates a modular sensor suite designed to ensure process stability and dimensional accuracy throughout the build.

The core configuration includes a pyrometer for continuous layer temperature monitoring, a layer geometry sensor, and a gas flow monitor – all feeding into a closed-loop automation system that adjusts process parameters in real time to maintain the optimal thermal window. For applications requiring more robust process documentation or tighter quality control, additional modules can be integrated on demand:



Thermal welding camera

full-area temperature mapping across the work envelope



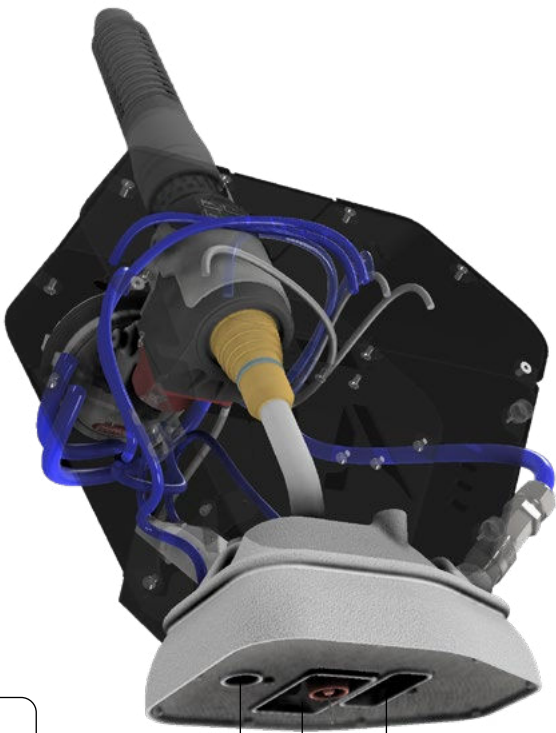
Profilometer

2D weld bead scanning for material characterization and process parameter definition



3D scanner

dimensional snapshots compared against the CAD model throughout the build



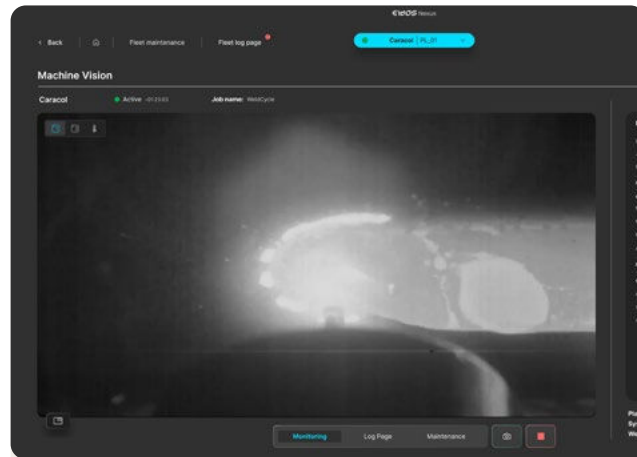
PYROMETER
ACCESS SPOT

THERMAL / WELDING
CAMERA ACCESS SPOT

PROFILOMETER
ACCESS SPOT

5. Eidos Manufacturing Software Suite

Caracol developed its software suite Eidos Manufacturing after years working on LFAM, slicing strategies, and robotic kinematics. The suite completes Vipra AM's platform to provide full control and flexibility.



Eidos Nexus

Vipra AM's monitoring suite collects and correlates sensor data with the robot's position in real time, generating a live digital twin of the process.

This gives operators full visibility over machine performance, consistent quality tracking, and detailed production records – while continuously feeding process feedback back into the system to drive optimization over time.

Through a collaboration with **Fraunhofer IAPT**, Europe's leading institute for AM industrialization, Eidos Nexus is being extended with closed-loop process control: live data from welding systems, pyrometers, profilometers, and thermal cameras actively maintains optimal process conditions throughout the build.

Developed in collaboration with



Eidos Builder

Vipra AM's slicing environment combines an intuitive interface with full parametric control over printing strategies and toolpath generation.

Operators can visualize the robotic platform in real time, simulate the build before printing, and select multiple slicing approaches (planar, revolved, or radial) to handle complex geometries with precision.

All production parameters are accessible and adjustable from a single workspace.

6. Enclosure

Caracol developed an advanced enclosure for Vipra AM. Engineered to ensure the optimal production space by combining advanced safety features, environmental control, and seamless integration with the platform.

Fume Management

Tailored for WAAM production, the system extracts and filters welding fumes, maintaining clean air inside the enclosure, protecting operators and equipment.

Surveillance

Cameras monitor the process and equipment status, with a live feed displayed on external screens for real-time access, enhancing safety and quality control.

Machine HMI

Centralized control of machine functions, like fume extraction, lighting, door, and process monitoring. The intuitive design allows for smooth operations and quick adjustments.

Lighting

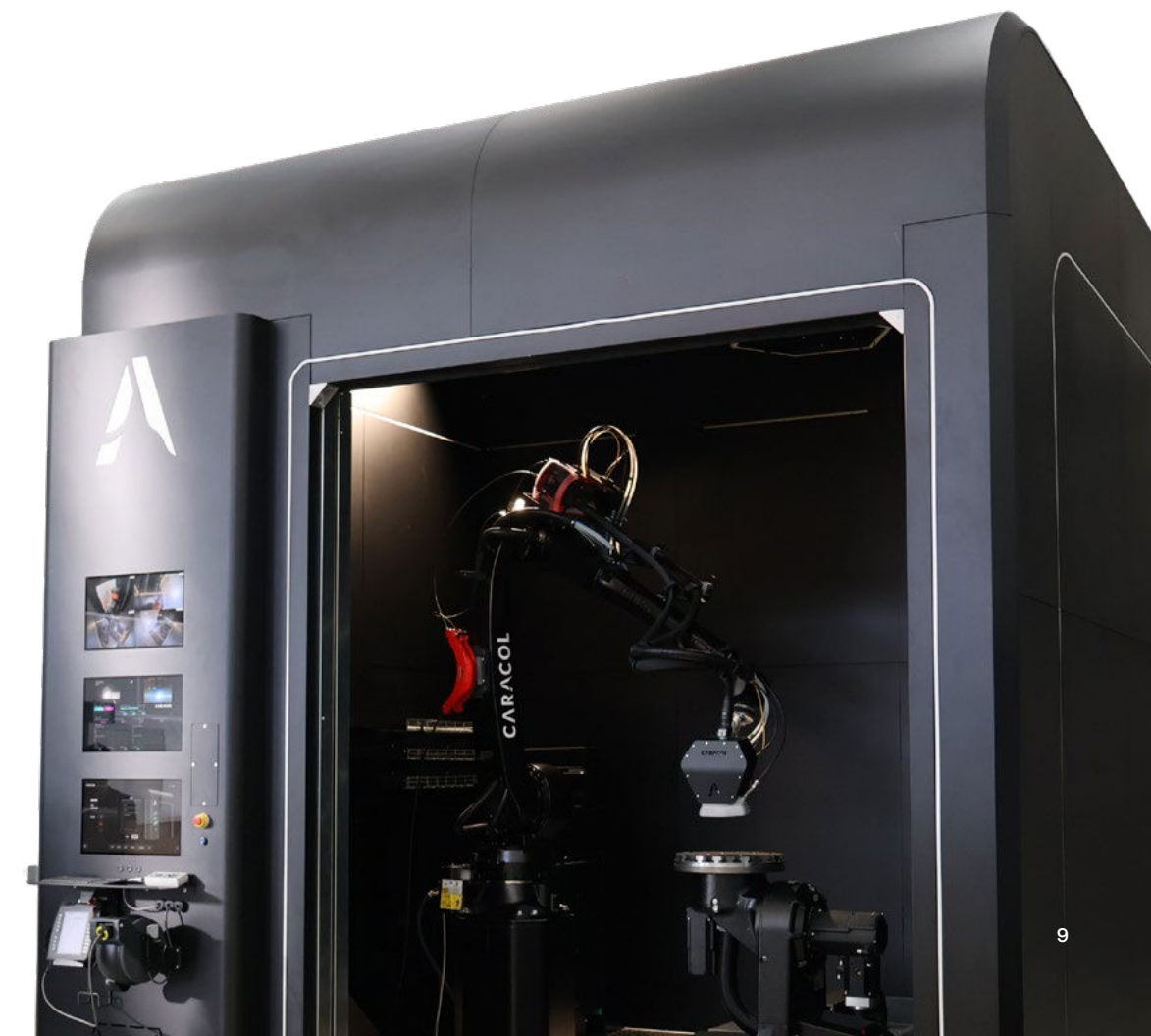
Shadow-free, daylight, lighting system, improves visibility during operations and maintenance, promoting precision, and reducing errors.

Automatic Door

Automatic locking to prevent unauthorized access, emergency stop buttons and safety interlocks, all centrally controlled for coordinated safety management.

Load & Unload Linear Track

A linear track system simplifies the loading and unloading of components, minimizing downtime and maximizing productivity.



Materials

A growing material portfolio, qualified for industrial metal production with Vipra AM

Caracol works with its materials partners daily to identify and qualify the best metal alloys for its process. This includes high-performance alloys, tested to ensure efficient production, superior technical properties, and minimization of costs and waste.

The **MATERIAL LAB** constantly works to expand the portfolio, selecting new materials and studying mechanical, thermal, chemical properties of printed parts, to provide the most suitable options for each client’s applications and guarantee reliable and repeatable production.

INVESTIGATION

identify target material and best suppliers

TESTING

the material successfully printed is tested to define its properties

CHARACTERIZATION

the material can be used for production

QUALIFICATION

parameters are defined to guarantee best printability, repeatability, and performance with the material

Caracol’s portfolio

VERSATILE & COST-EFFECTIVE

• ER70S-6	STEEL
• ER100S-G	STEEL
• 316L	STAINLESS STEEL
• 17-4 PH	STAINLESS STEEL
• 410 NiMo	STAINLESS STEEL

GREAT THERMAL PROPERTIES

• Invar 36	IRON-NICKEL ALLOY
• Inconel 625	NICKEL-BASED SUPERALLOY

LIGHTWEIGHT & HIGH STRENGTH

• Al2319	ALUMINUM ALLOY
• Al6061	ALUMINUM ALLOY
• Al7075	ALUMINUM ALLOY

THERMAL CONDUCTIVITY & HARSH ENVIRONMENTS

• CuAl8Ni6	COPPER ALLOY
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Everything you need is in the full Vipra AM Materials brochure. Scan to explore qualified alloys, technical specs, and real production examples across aerospace, energy, marine, and oil & gas. [Or click here!](#)

From technology to applications

How players across industries are implementing robotic LFAM

Caracol developed its platforms to expand the potential of additive manufacturing to large, complex, industrial applications. After years invested in production of parts and components alongside industry leaders, the application-first approach remains central to how Caracol develops its technology.

The industries we work in:



Aerospace



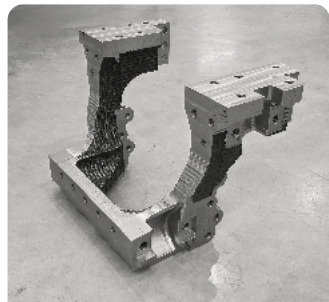
Automotive



Railways



Architecture & Construction



Defense



Marine



Education



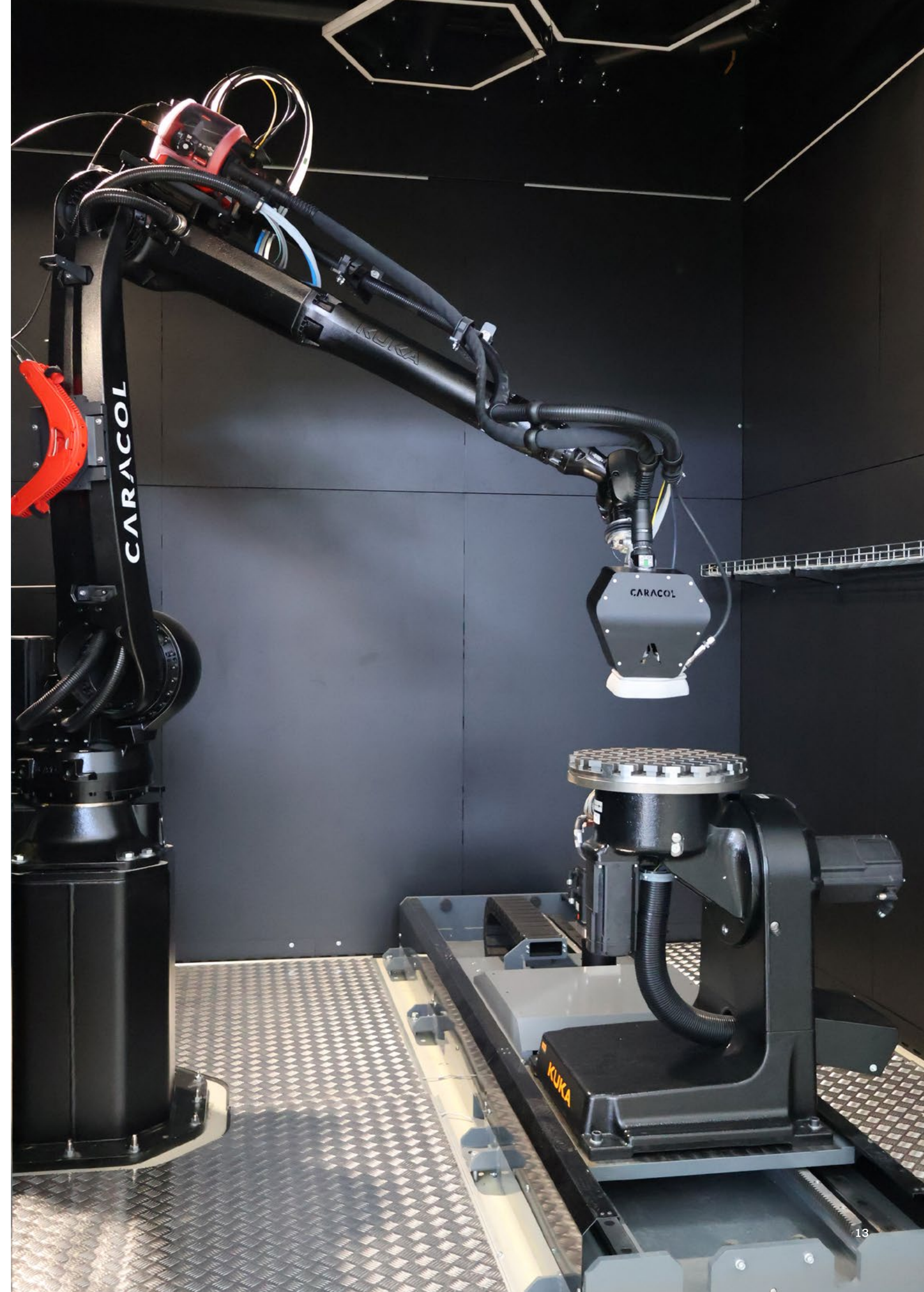
Energy

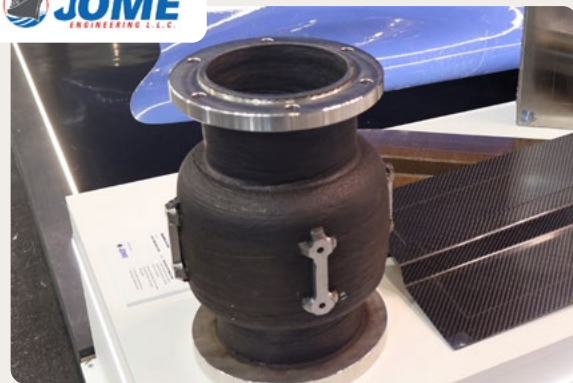


Industrial



Jigs & Molds





ENERGY

SAMPLING VALVES

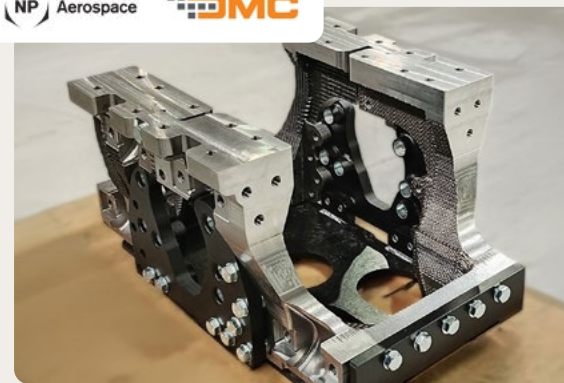
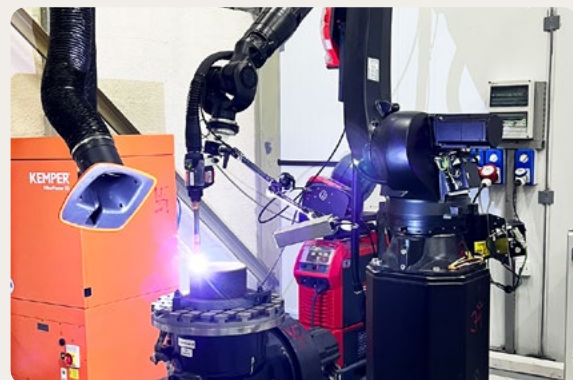
Vipra AM was used to produce a **SS316L sampling valve body** for oil & gas applications in just **7.5 hours of printing time** — a component that traditional casting would have taken around 60 days to deliver.

The near-net-shape build eliminated mold preparation entirely, cutting material waste and machining time while keeping full compliance with performance requirements at **5 bar line pressure**.

Total lead time dropped by up to 90%, opening a faster and more flexible supply chain model for critical offshore and marine components.



Scan to discover the full project,
[or click here!](#)



AUTOMOTIVE

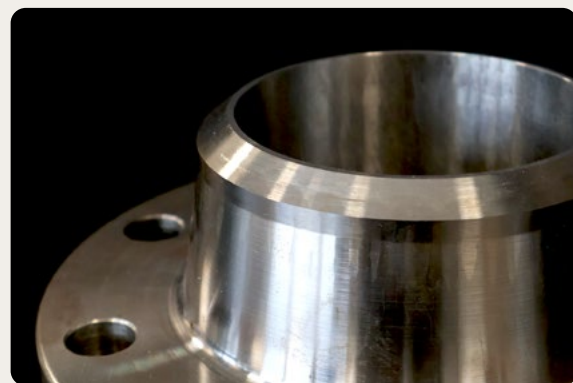
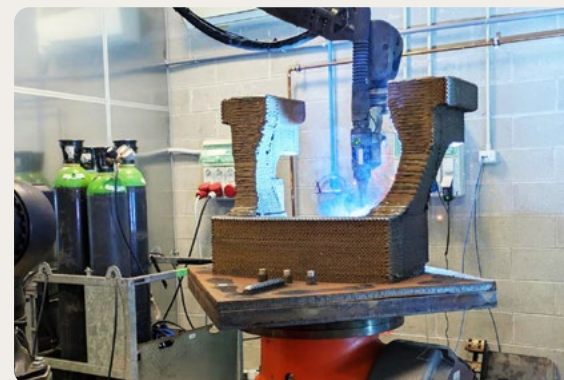
MASTIFF SUSPENSION & DIFFERENTIAL CARRIER

Vipra AM was used to produce a Mastiff suspension and differential carrier in **ER100 steel** in approximately **60 hours**, replacing casting and forging entirely.

The system's multi-axis positioning enabled extreme overhangs and organic geometries that fixed-axis platforms simply can't handle, while **eliminating tooling costs and cutting lead time by up to 50%**. The process route is inherently scalable for spiral development programs, giving defence and dual-use manufacturers a faster, more agile path to low-volume production of high-complexity structural parts.



Scan to discover the full project,
[or click here!](#)



ENERGY

MULTI-MATERIAL NECK FLANGE

Caracol's WAAM system produced a **multi-material** neck flange for oil & gas applications by combining **Inconel 625** and **ER70S Steel** within a single part — depositing the high-performance alloy only where corrosion resistance and thermal stress demand it, and the more cost-effective steel everywhere else.

The entire **14 kg component** was printed in just **3 hours at 5 kg/h**, delivering a solution that matches the mechanical requirements of subsea systems and high-temperature piping while keeping material costs under control.



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MARINE

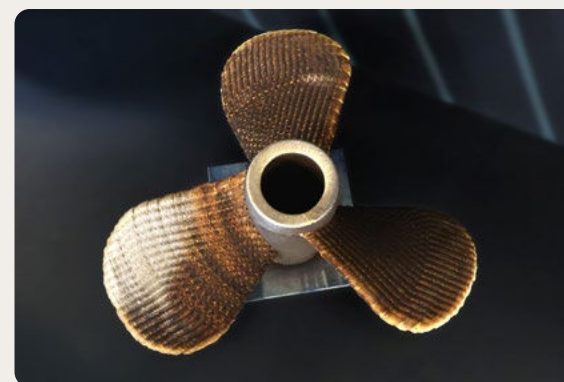
MARINE PROPELLER

WAAM technology produced a custom marine propeller in **CuAl8Ni6 Aluminum-Nickel-Bronze** — a **45 kg component** printed in just **10.5 hours at 4.6 kg/h**.

The alloy's inherent resistance to saltwater corrosion, cavitation, and mechanical stress makes it the material of choice for demanding marine environments, and Vipra AM's deposition process preserves those properties while enabling fully custom geometries that conventional casting struggles to achieve. The result is a **faster, leaner production route** with less material waste and no mold needed.



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[or click here!](#)





AEROSPACE

AEROSPACE SPAR TOOL

A pilot project in the aerospace tooling sector validated Vipra AM's capability to produce a full-size **316L stainless steel** spar tool, designed for carbon fiber lamination, in just **30 hours at 3.7 kg/h deposition rate**.

The near-net-shape approach eliminated conventional tooling setups, drastically reduced material waste, and cut the **final part weight by 50% compared to traditional manufacturing**, while meeting the tight dimensional tolerances aerospace applications demand.



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[or click here!](#)



AEROSPACE

PRESSURIZED TANKS

Vipra AM was used to produce a pressurized aluminum tank in **AL2319** for carrier satellites designed to deploy CubeSats into orbit.

The monolithic single-piece build eliminates **any need for assembly, reduces material waste** compared to subtractive methods, and enables weight-optimized geometries that directly translate into lower launch costs.



Scan to discover the full project,
[or click here!](#)



Caracol manufacturing services

At your service, to guarantee your manufacturing continuity.

Application Development: Caracol supports the development and optimization of additive manufacturing applications through a proven methodology focused on performance, scalability, and economic viability.

Training & Ramp Up Support: Our training and support services help operators and technical teams quickly build expertise, ensuring safe, efficient, and scalable manufacturing operations.

After-Sales Support: Caracol provides dedicated after-sales services to maximize machine uptime through technical assistance, remote diagnostics, continuous optimization, and global support.

Material & Process Qualification: We qualify materials and manufacturing processes to ensure reliable and repeatable production, supporting both standard portfolios and custom solutions for demanding industrial applications.



Services evolve with your production needs.

Scan to download the full services brochure: packages, training programs, and everything Caracol offers to keep your system running at its best.
[Or click here!](#)



Technical data

	Vipra XP	Vipra XP - Studio
Build Volume [m ft]	approx. 2.5 x 2.0 x 2.0 8.2 x 6.6 x 6.6	
Max Deposition Rate [kg/h lb/h] (measured through a standardized qualification procedure printing with SS316)	approx. 6.0 13.2	
Layer Height [mm in]	1.0 - 2.5 0.04 - 0.10	
Positioner Payload [kg lb]	750 1650	
Process Technology	Wire Arc Additive Manufacturing (WAAM)	
Power Source	CMT - Cold Metal Transfer	
Operational Gas	Argon and Argon mixtures	
Head Dimensions [mm in]	430 x 260 x 300 16.9 × 10.2 × 11.8	400 x 235 x 100 14.7 x 9.3 x 3.9
Weight of the Head [kg lb]	15 33	7 15.5
Integrated Anti-collision System	Yes	
Monitoring System	Caracol Nexus Monitoring Dashboard	NO
Sensor - Pyrometer	Yes	NO
Sensor - Profilometer	Optional	NO
Materials Compatibility, examples	Steels, Stainless Steels, Aluminium alloys, Nickel alloys, Copper alloys	
Wire Diameter Size [mm in]	0.8 - 1.6 0.03 - 0.06	
Wire Feed Speed [m/min ipm]	1.0 - 15.0 39 - 590	
Max Power Requirement	35 kW	
Max Supply Current	<63 A	
Compliance	CE marked	

ENCLOSURE	Vipra XP	Vipra XP - Studio
Enclosure Footprint [m ft]	4.2 x 5.1 x 4.3 13.8 x 16.7 x 14.1	NO
UV Resistant Paint on Panels	Yes	NO
Fume Extractor	Yes	NO
Wire Feedstock Storage Units	Yes	NO
External & Internal LED	Yes	NO
Surveillance Camera	Yes	NO
Display HMI and PC	Yes	NO
Safety Interlocks Architecture	Yes	NO

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