

heron aim™

**Turnkey Robotic LFAM Platform
for Composite 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.

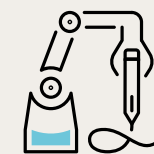
Application-first approach

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 bigger, print better with Heron AM

Heron AM is Caracol's robotic platform for the production of parts in polymers and composites. Built for industrial applications that demand high performance at scale, with no compromises on precision, speed, or material quality.



Flexibility

freedom in customizing part design and geometries.



Efficiency

optimized lead times and lower costs, with industrial quality.



Sustainability

enable circular economy loops, cut waste, and access recycled materials.

An Ecosystem to Enable Advanced Manufacturing

We provide our composite 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.

Modularity & Integration

The turnkey platform Heron AM can be modularly configured to fit clients' needs.



- 1 ROBOTIC ARM
- 2 EXTRUDER / END EFFECTOR
- 3 EIDOS MANUFACTURING SOFTWARE SUITE
- 4 PRINTING BED
- 5 CONTROL SYSTEM
- 6 CONTROL CABINETS
- 7 DRYING & FEEDING SYSTEM

up to **85%**
LEAD TIME REDUCTION

up to **70%**
COST REDUCTION

* Data estimated from actual projects delivered by Caracol and its clients with Heron AM.

1. Robotics

Heron AM leverages 6+ axes industrial anthropomorphic robotic arms, to access the kinematic capabilities needed to maximize flexibility when producing advanced complex parts.

Built to meet specific manufacturing needs and applications — it can be modularly set up, with various different arm sizes, tool changing stations for hybrid processes, rails and plinths to extend the volume.

Caracol has a multi-robot approach, allowing clients to select the best automation solution to fit their needs from a range of leading global brands (e.g., KUKA, FANUC, ABB) — custom developments can be evaluated upon request.



Heron AM - Rail setup

Paired with its rail extension, Heron AM breaks free from fixed workspace limits and reaches print volumes that simply weren't possible before.

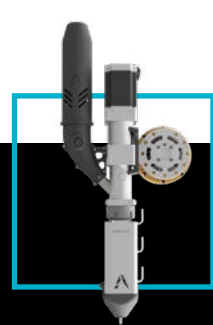
The rail setup works with both the 300 and 400 robotic arm versions and comes with a dedicated modular printing bed, sized to match your production needs.

Rails are available in 6, 9 and 12 meter lengths, so the system grows with the scale of your projects rather than the other way around.

2. Extruders

Caracol's extruders are engineered for specific applications, tailoring precision, flexibility, and throughput based on specific production needs.

They are built to process a wide range of thermoplastic and composite pellets, from high-performance to recycled or bio-based materials.



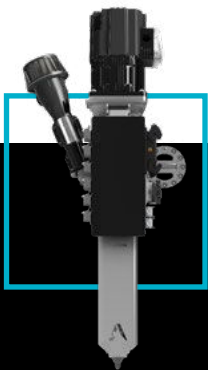
High Accuracy (HA)

Lightweight, compact print head – developed to provide agility, quality finishing, detail, and precision. Ideal for finished parts for sectors such as transportation, design, furniture, or art – which require fine detailing thanks to its adaptability to nozzles from 1 to 5 mm.



High Flow (HF)

Robust, high throughput extruder for large scale, advanced parts — developed for fast material processing, an extensive range of materials with its 450°C (842° F), high print quality, and efficiency. With nozzles ranging from 5 to 18 mm it is ideal for large tools and molds, large structures such as boat hulls or automotive bodies, as well as for construction.



High Versatility (HV)

Flexibly adapts to diverse industrial needs — it is ideal for a broad range of applications: from finished parts, such as boat super structures, small to mid-sized tools, jigs, and fixtures, to design and architectural structures. It can be fitted with nozzles from 2 to 8 mm and meets temperatures up to 450 °C (842 °F) to process advanced materials.



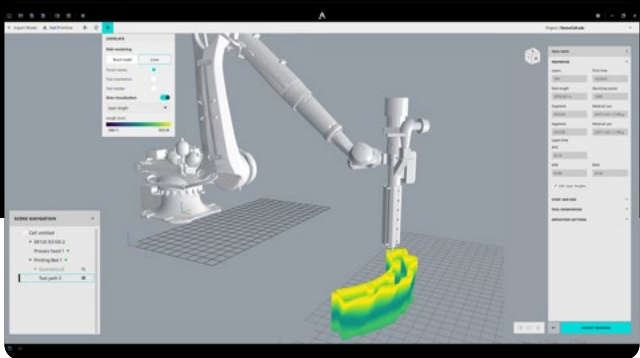
Extreme High Flow (xHF)

Engineered to maximize throughput, precision and material flexibility, with advanced plasticization and thermal control. The xHF extruder features a dual chamber and custom nozzles, aimed at producing high-performance composite parts for a more precise and efficient use.*

* Limited Release: part of our ongoing R&D program, available for pilot applications and performance evaluation.

3. Eidos Manufacturing Software Suite

Eidos Manufacturing is Caracol's proprietary software suite, developed specifically for its robotic platforms. It covers the full production workflow, from file to production, connecting process control, monitoring, and data management in one.



Eidos Builder

The slicing and programming environment, Builder converts 3D files into optimized machine programs, with advanced toolpath strategies across 6+2 axes, from planar to non-planar and conformal. It includes toolpath simulation with collision and singularity check, a material library with preset parameters, and pre-production analysis of print time and material consumption.

For fully automated hybrid workflows, it also allows for Print, Scan & Machine functions to enable continuous multi-process production cycles.

	Heron AM - Printing	Heron AM - Hybrid Manufacturing
Slicing & toolpath planning	✓	✓
Seamless workflow for all end effectors (print, scan, & machine)		✓



Eidos goes deeper than any overview can cover
Scan for the full brochure to explore slicing strategies, AI-powered process control, and everything in between.
[Or click here!](#)



Eidos Nexus

The monitoring and fleet management platform. Nexus provides real-time process and machine monitoring, 3D data mapping, job history, preventive maintenance, remote technical assistance, and full fleet management via a centralized dashboard. Raw data streams directly to ERP, MES, and third-party applications via API.

Eidos Nexus also integrates AI-based process control capabilities that enable the platform to monitor, analyze, and adjust production autonomously.

	Lite	Advanced	AI
Live Monitoring	✓	✓	✓
Remote Service	✓	✓	
Remote control software updates	✓	✓	✓
Preventive Maintenance	✓	✓	✓
Fleet Management	✓	✓	✓
Management Dashboard		✓	✓
Time Series		✓	✓
Digital Twin		✓	✓
API		✓	✓
Smart Quality Reports + Predictive Maintenance + Material Development Agent + Closed Loop Agent			✓

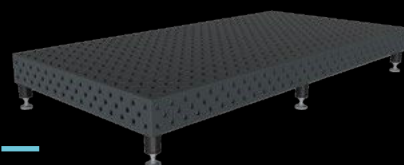
4. Printing Bed

Print beds are critical to successful production. Each model is built to meet specific application needs and can be customized in size.



FLEXIBLE

Configurable aluminum frame with interchangeable wood top panels, a cost-effective solution adaptable to different production requirements. Payload capacity up to 250 kg.



HEAVY DUTY

Built for the most demanding industrial production; the high rigidity steel frame handles heavy tooling applications and hybrid print-mill workflows without compromise. Wood top panels interchangeable. Payload capacity up to 3000 kg.



AUTOMATIC (patented)

Steel profile conveyor system that continuously cycles printed parts off the bed, enabling fully unattended production runs. Unmanned part clamping and automatic release eliminate operator dependency. Includes heating. Payload capacity up to 500 kg.



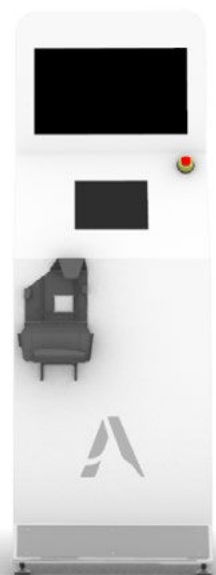
HEATED

Lightweight aluminum heated printing plate delivering best-in-class surface finish with no post-processing required. Temperature-controlled adhesion eliminates mechanical gripping on the first layer, ideal for easily warpable materials. Controllable temperature up to 110°C per module. Heated units can be added for FLEXIBLE.

5. Control

For the range, a dedicated automation and control suite was developed. The aim is to enable true modularity on Heron AM platforms, flexibility allowing clients to work with a custom end-effector for different needs and applications, with plug-and-play logic.

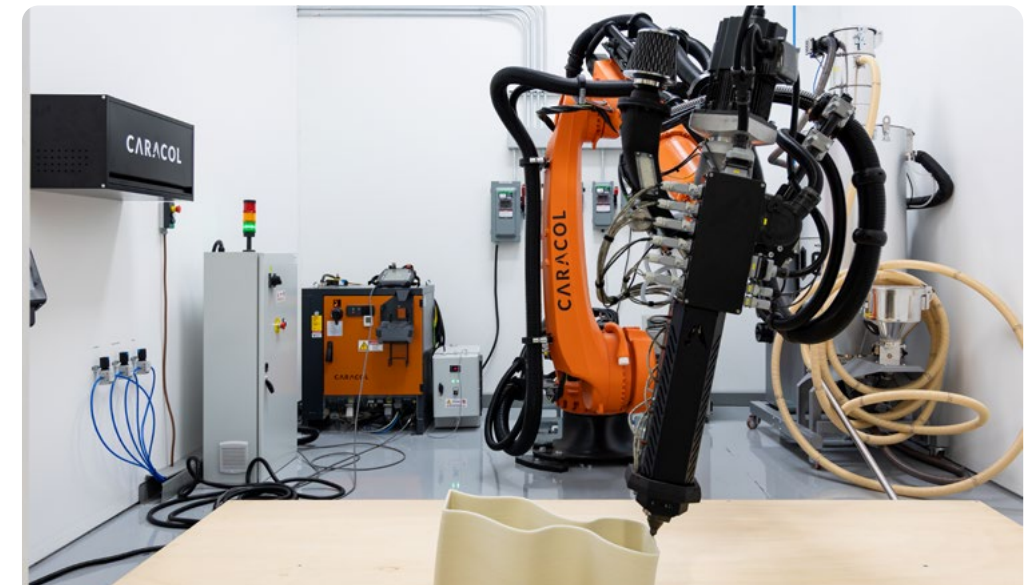
A user-friendly HMI enables smooth control of extruder and process parameters and quick side machine operations, and with Eidos Nexus IoT you can visualize live data on your print and machine status easily.



6. Enclosures

Enclosures and perimetral protections are necessary to ensure operator safety and optimal printing conditions.

There are several options available to meet specific shop floor needs when a partitioned / walled production dock isn't available, such as safety light curtains or protective enclosures.



7. Drying & feeding system

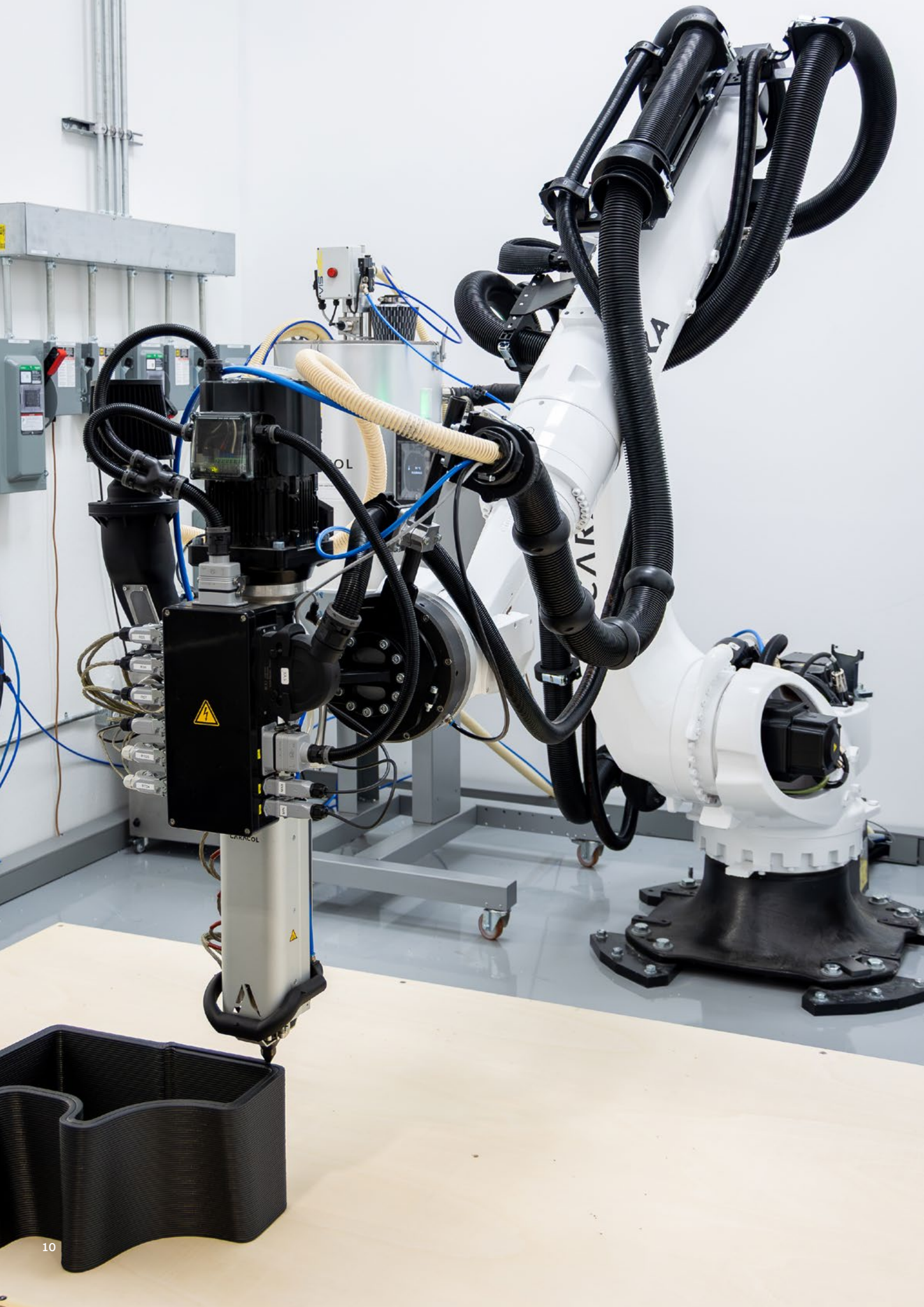
Caracol's automated drying & feeding system ensures a direct and continuous material supply throughout the printing cycle.

The unit is connected to the extruder to input pellets throughout the printing cycle, eliminating manual operations. Pellets are stored at the right humidity and temperature and dried for best performance and quality. Different sizes and performance of drying and feeding systems are available to match different extruders, ensuring a stable process.

Automatic Extruder Purging system

A standard self-cleaning system for extruder purging at the end of each print job. This advanced feature allows for safe, unattended printing even with demanding materials, significantly reducing the need for manual intervention. Prints can finish overnight without requiring an operator to clean the extruder, ensuring safety, uptime, and machine utilization.

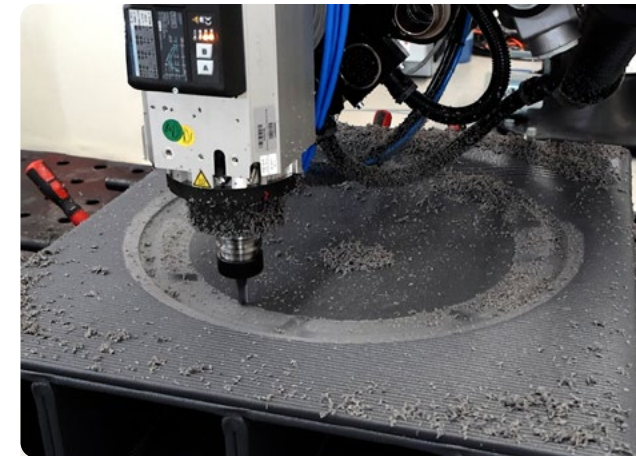




Automatic Tool Changer

Heron AM can be equipped with a fully automatic tool changing station, enabling seamless switching between extruder, 3D scanning, and milling spindle.

Tool changing can be useful for different needs:

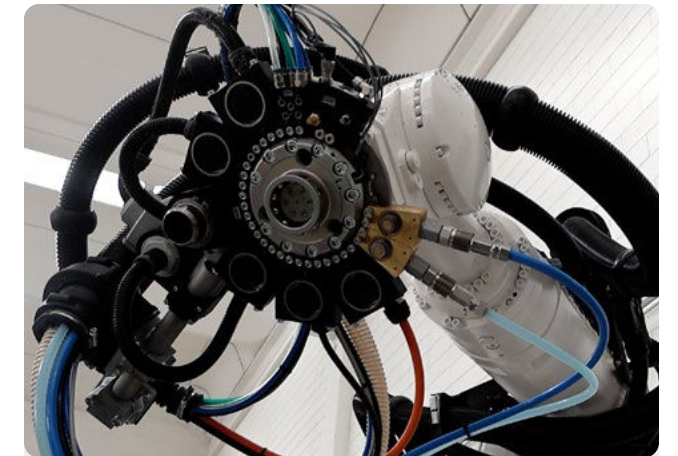


Hybrid system

Combines LFAM with 3D Scan, and CNC milling. The robot switches automatically between end effectors, such as extruder and milling spindle, enabling printing, scanning, trimming, cutting, drilling, and surface finishing operations seamlessly.

Benefits

- Automated scanning and milling in a single robotic platform, reducing manual rework and setup time.
- Increased part quality and finishing accuracy, especially on large and complex geometries, thanks to dedicated and semi-automatic calibration procedures.
- Reduced operator involvement through integrated tool change and calibration cycles.



Multi Extruder

Enables automatic switching between two different extruders within the same job. This allows combining high-throughput production with precision printing on a single part, without reconfiguration.

Benefits

- Particularly well-suited for applications where robotic milling meets precision requirements — such as maritime, automotive, and creative — for producing finished parts, aesthetic parts, and for roughing and holes for jigs or molds.
- Ideal for industries requiring flexible, automated manufacturing of small production runs, minimizing post-processing and manual labor while ensuring high precision and efficiency.

Materials

A growing material portfolio, qualified for industrial composite production with Heron AM

Caracol works with its materials partners daily to qualify advanced thermoplastic composite materials for its process. This includes a range of materials from bio-based, recycled, to high-temperature materials such as autoclave composites, tested to guarantee efficient production, top technical properties, and minimal 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 extruded
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

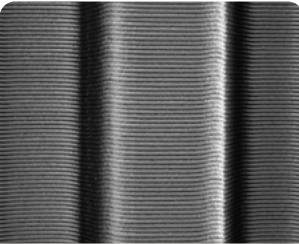
Caracol's portfolio

GENERAL PURPOSE AND RECYCLED



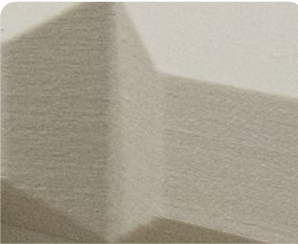
PET-G
Polyethylene
Terephthalate Glycol

rPETG
rPETG + 30% GF



ABS
Acrylonitrile Butadiene
Styrene

ABS + 20% CF
ABS + 20% GF



PP
Polypropylene

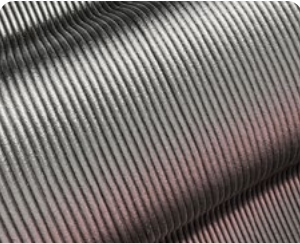
rPP + 30% GF

FLEXIBLE & ELASTOMERIC



TPE
High Strength and
Flex Elastomer

HIGH-TEMPERATURE & STRUCTURAL



PC
Polycarbonate

PC + 20% CF



PEI
Polyetherimide

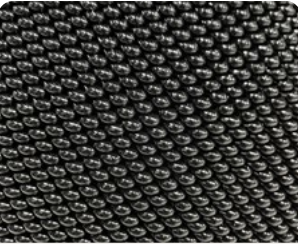
PEI + 20% CF



PA
Polyamide

PA66 + 25% GF

BIO-BASED & SUSTAINABLE



PLA
Polylactic Acid

**PLA + Oyster / Olive /
Pine**

UV AND CHEMICAL RESISTANT



ASA
Acrylonitrile Styrene
Acrylate

ASA + 20% GF



HDPE
High-Density
Polyethylene

HDPE + 20% CF



Every polymer is validated for a different production challenge.
Scan to explore the full Heron AM Materials brochure: specs, applications, and real production examples across transportation, construction, and design. [Or click here!](#)

From technology to applications

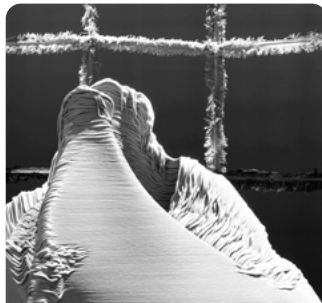
How players across industries are implementing robotic LFAM

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



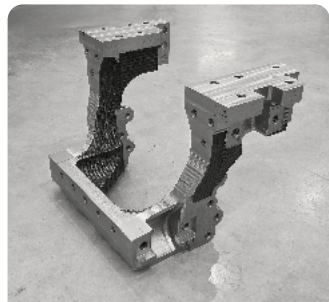
Art & Entertainment



Architecture & Construction



Automotive



Defense



Design & Furniture



Education



Energy



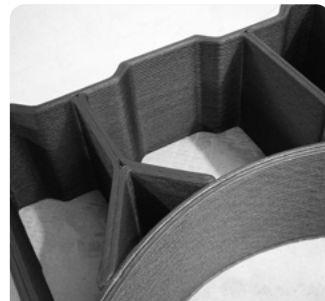
Industrial



Marine



Railways



Jigs & Molds





AEROSPACE

COMPOSITE LAMINATION MOLD - FORMES ET VOLUMES

With Heron AM, F&V replaced a multi-part conventional tooling process with a single monolithic structure — a **2200×2200×600 mm** composite lamination tool, **180 kg**, printed in **PC with 20% carbon fiber** in just **19 hours**. The hybrid workflow combining near-net-shape robotic printing, CNC finishing, and autoclave post-processing delivered measurable results: **50% reduction in lead time, 30% in production costs, 50% less material waste, and 50% lighter part weight**.

The tool is already deployed in an active aerospace production environment, confirming process reliability under real production conditions.



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



AUTOMOTIVE

END-USE PARTS FOR CUSTOM VEHICLES - VAN VENROOY UTILITY VEHICLES

Robotic LFAM enabled Van Venrooy's direct, in-house production of end-use exterior components — bumpers, fenders, taillight covers — for custom specialized vehicles, processed in **carbon fiber reinforced ABS** and finished in approximately **5 days**.

Lead times dropped by up to 85% compared to conventional methods, with no tooling costs, reduced dependency on external suppliers, and the flexibility to handle both one-offs and small series while maintaining tight tolerances and surface quality.



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



MARINE

THE FIRST 3D PRINTED CATAMARAN - V2 GROUP

V2 Group leveraged LFAM to produce the first fully functional monolithic catamaran hull — **6000×2300×1500 mm**, **1200 kg**, printed in **recycled polypropylene with 30% glass fiber** reinforcement in a single uninterrupted **160-hour** run. Eliminating molds and multi-part assemblies translated into **20% shorter lead times** and **30% less material waste**, while the seamless structure enhanced overall structural integrity.

The entire workflow — from FEM and hydrostatic analysis through CNC finishing and gel coating — was designed from the ground up with future industrialization in mind, making it a replicable and scalable production model for the nautical sector.



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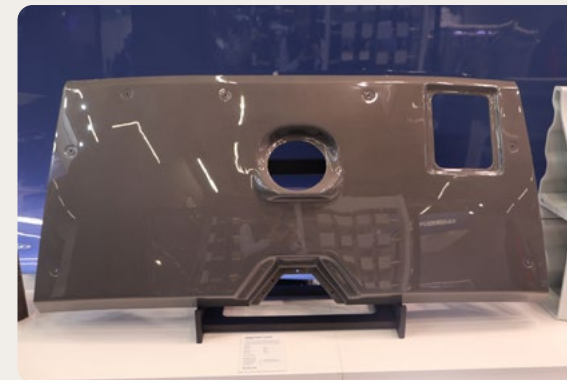


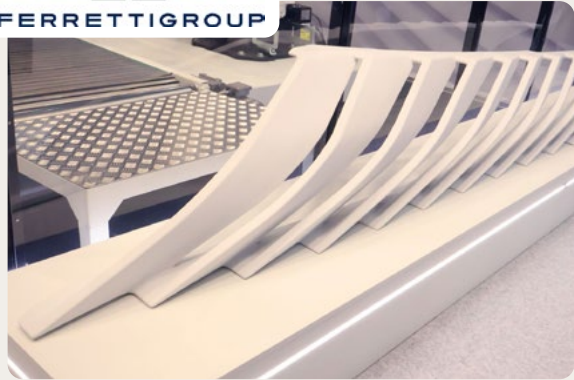
RAILWAYS

TRAIN FRONT COVER, FLAME RETARDANT FINISHED PART - ALSTOM

Alstom adopted Heron AM for the production of a certifiable, finished part for its train's front cover. The single part, sized **1800×800×80 mm**, **20 kg**, was printed in flame retardant **PA66 with 25% glass fiber** and EN-45545 compliant — in just **18 hours**, with no molds or tooling required.

Compared to traditional fiberglass mold processes, the approach delivered a **70% reduction in lead time** strongly impacting usual train downtimes affected by damaged parts, **40% less waste**, and **30% lower costs**, while giving OEMs greater design flexibility and eliminating the need to store legacy spare parts.





MARINE

PERSHING GTX116 AERODYNAMIC GRILLES - FERRETTI GROUP

The side air intake grilles and windshield visor of a 35-meter luxury sports yacht — **4200×400×400 mm, 40 kg**, printed in **ASA with 20% glass fiber** in **72 hours** via Heron AM — were produced without a single mold or manual lamination step, going directly from digital model to finished part with a gel coat surface treatment.

Compared to traditional fiberglass methods, this translated into **50% shorter lead times, 60% less scrap, and a 15% reduction in component weight**, with full design freedom for complex and customized geometries.



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



VITRUVIAN



ARCHITECTURE & CONSTRUCTION

CUSTOM COLUMN FORMWORK - VITRUVIAN

Traditional concrete column formwork requires assembling multiple milled wood parts, coating them with toxic release agents, and destroying the entire mold after a single use. With Heron AM, the same formwork — **600×500×850 mm, 16 kg**, printed in **PP with 30% glass fiber** in **15 hours** — becomes a reusable, customizable structure with zero material waste, since PP naturally prevents adhesion to concrete with no chemical agents needed.

Lead times dropped by 30%, while full design freedom allowed seamless integration with other additively manufactured architectural elements, opening a genuinely scalable path for load-bearing construction components.



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



DESIGN & FURNITURE

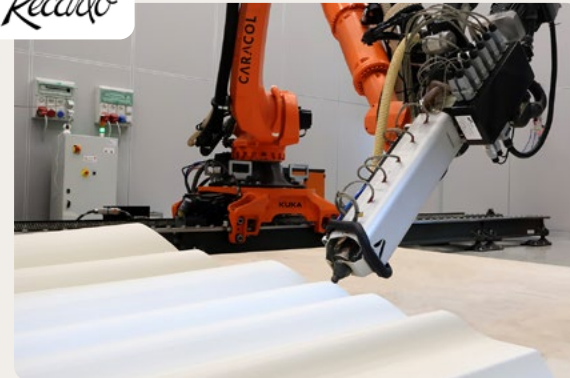
A NEW ERA OF FURNITURE - DECIBEL MADE

Presented at Milan Design Week 2025, PORTAL is a collection of sculptural chairs designed by international creatives using AI-assisted tools and brought to life through Heron AM using recycled and bio-based materials — primarily **rPETG with 30% glass fiber** and **PLA**. Each piece was printed in **4 to 20 hours** depending on complexity, with weights ranging from **10 to 25 kg**, demonstrating how robotic large-format additive manufacturing can translate AI-generated geometries into finished, customized furniture with no molds and minimal manual intervention.

Beyond the design ambition, the project points to a concrete production model: on-demand, localized micro-factories capable of manufacturing complex, fully custom pieces at scale.



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



DESIGN & ARCHITECTURE

LUXURY RETAIL EXPERIENCE - RECARLO

For the opening of its first flagship store in Milan's Montenapoleone district, a sculptural wall panel evoking a draped velvet curtain was produced via Heron AM in **3 sections totaling 6000×3900 mm** — each printed in **rPETG with 30% glass fiber** in **55 hours**, weighing **160 kg**, then milled and painted in the brand's signature corporate blue.

The geometric freedom of robotic additive manufacturing made it possible to achieve a trompe l'oeil effect at scale, with the visible layering texture becoming a deliberate aesthetic feature, impossible to replicate cost-effectively through traditional fabrication and with minimal material waste thanks to the use of a recycled material.



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



Technical data

EXTRUDER	HA High Accuracy	HV High Versatility	HF High Flow	xHF Extreme High Flow*
Max Throughput (kg/h - lb/h)	2 - 4.4	12 - 26.5	30 - 66.1	75 - 165
Heat Zones (#)	3	3	3	8
Max Temperature (°C - °F)	350 - 662	450 - 842	450 - 842	450 - 842
Cooling Zone (#)	1	2	2	2
Nozzle Range (mm)	1 to 5	2 to 8	5 to 18	5 to 24
Start and Stop	YES	YES	YES	N/A
Melt Flow Modulation	NO	YES	YES	N/A
Layer Cooling Unit & Anti-collision system	INCLUDED	INCLUDED	INCLUDED	INCLUDED
Weight (kg - lb)	16 - 35	45 - 99	75 - 165	205 - 452
Dimensions (mm - in)	800 x 300 x 150 - 31.5 x 11.8 x 5.9	1150 x 550 x 300 - 45.3 x 21.7 x 11.8	1500 x 550 x 350 - 59.1 x 21.7 x 13	1780 x 425 x 650 - 70.1 x 16.7 x 25.6

*Limited Release

SYSTEM	HERON 200	HERON 300	HERON 400
Extruder type	HA	HA, HV, HF	HV, HF
Robot Reach options (mm - in)	2100 - 83	3100 - 122	3900 - 154
Cell Dimension (W x D x H) (mm - ft)*	4000 x 4000 x 3000 - 13.1 x 13.1 x 9.8	5000 x 5000 x 4500 - 16.4 x 16.4 x 14.8	6000 x 6000 x 5500 - 19.7 x 19.7 x 18.0
Print bed area (m - ft)	1.5 x 1.5 - 4.9 x 4.9	1.5 x 3 - 4.9 x 9.8	3 x 3 - 9.8 x 9.8
Print bed type	Flexible	Flexible, Heavy Duty, Heated, Automatic	Flexible, Heavy Duty, Heated
Max Part Weight (kg - lb)	250 - 551	3000 - 6614	3000 - 6614
Modularity Extension (m)	N/A	Rail 6 or 9	Rail 6 - 9 - 12
AC Power Frequency (Hz)	50-60	50-60	50-60
Min Air Flow Pressure (bar)	6	6	6

*Recommended

PRINTING BEDS	FLEXIBLE	HEAVY DUTY	AUTOMATIC	HEATED
Composition	Aluminum structure + Interchangeable wooden tops	Steel + Interchangeable wooden tops	Automatic conveyor bed for continuous production runs	Heated printing plate for best surface finish and bed adhesion
Dimensions (print surface) (m - ft)	1.5 x 3 - 4.9 x 9.8	1.5 x 3 - 4.9 x 9.8 3 x 3 - 9.8 x 9.8	1.5 x 2.5 - 4.9 x 8.2	1.5 x 2.5 - 4.9 x 8.2
Modular Extension	YES	YES	N/A	YES
Max Payload (kg - lb)	250 - 551	3000 - 6614	500 - 1102	250 - 551



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!](#)

Caracol S.r.l.
Via Marisa Bellisario 6C
Bariassina (MB) | Italia

Caracol Inc.
1007 South Heatherwilde Blvd Ste 700
Pflugerville (TX) | US

General Requests: info@caracol-am.com
Commercial Requests: bd@caracol-am.com

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Version: HERON AM - 2606

CARACOL