

MATERIALS

Advanced metal alloys qualified
for robotic WAAM platform **Vipra AM**

CARACOL



Print faster, print stronger with Vipra AM

The turnkey, integrated platform
that will drive you to the
next manufacturing revolution

Vipra AM is Caracol's robotic platform for large-format additive manufacturing with metal alloys.

Built for industrial applications that demand high performance at scale, with no compromises on strength, speed, or quality.

Our Approach to Materials

Access best materials and ensure quality, control and repeatability on your prints and production process

To simplify your search for the right wire to use on your large-scale projects and applications, Caracol has selected a broad range of best-in-class metal alloys from leading material partners that you can purchase.



Caracol's Vipra AM platforms are **made to process a broad range of materials**, that the company thoroughly tests and qualifies for direct, continuous printing: from advanced metal alloys to upcycled waste or parts at the end of their life.

Our **MATERIAL LAB** constantly works to expand the range of alloys available **qualifying only the best performing advanced metals** for Vipra AM™ platforms.

Are you looking for a specific new alloy or your projects require a specific compound?

Vipra AM machines are open, and we'd love to support you in developing, identifying, and qualifying new materials for your applications. Reach out to our team for more info at **bd@caracol-am.com**

Each new materials investigated and studied in terms of mechanical, thermal, chemical properties on printed parts, to identify the best options on the market for our clients and guarantee reliable and repeatable production.

QUALIFICATION PROCESS

- INVESTIGATION**
identify target material and best suppliers
- TESTING**
the material successfully deposited 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

Our Portfolio

Caracol's materials selection aims to offer **broad production possibilities on WAAM across applications** - from advanced molds and tools, to high performance mechanical components.

This is why our portfolio spans a wide range of metal alloys, from stainless steels to aluminum, nickel-based superalloys, and copper alloys, each tested to ensure reliable deposition, strong mechanical performance, and a process that keeps quality and material waste under control.

Our application engineering experts are always glad to share our know-how on what are the best materials for each project with our clients.

VERSATILE & COST-EFFECTIVE

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

LIGHTWEIGHT & HIGH STRENGTH

- | | |
|-----------------|----------------|
| • Al2319 | ALUMINUM ALLOY |
| • Al6061 | ALUMINUM ALLOY |
| • Al7075 | ALUMINUM ALLOY |

THERMAL CONDUCTIVITY & HARSH ENVIRONMENTS

- | | |
|-------------------|--------------|
| • CuAl8Ni6 | COPPER ALLOY |
|-------------------|--------------|

GREAT THERMAL PROPERTIES

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

ER100S-G
Steel

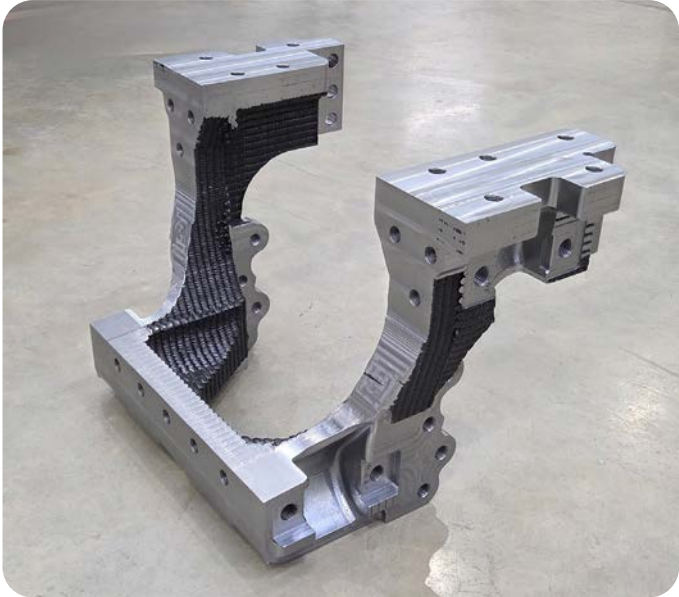
It's a high-strength low-alloy steel welding wire, typically used to produce deposits comparable to S690/S700-class steels in terms of strength level. It is suitable for WAAM fabrication of structural and Oil & Gas components such as valves, fittings, flanges, heavy machinery parts and offshore structures. It provides high tensile strength, good toughness and adequate ductility when combined with proper post-build heat treatment.

AUTOMOTIVE

Mastiff suspension
& differential carrier

NP Aerospace and DMC produced a Mastiff suspension and differential carrier using WAAM, replacing traditional casting and forging.

The fully structural 110 kg component (540 × 500 × 500 mm) was printed in about 60 hours with Vipra AM, followed by heat treatment and machining. The result: up to 50% shorter lead times, zero tooling costs, and complex geometries with extreme overhangs, all while matching the performance of the conventionally manufactured part.



316L
Stainless Steel

This austenitic stainless steel is ideal for demanding marine (propellers, hull fittings, and structural parts), oil & gas (pipelines, flanges, and valves), and chemical applications (tanks, reactors, and piping). Known for excellent corrosion resistance to rust, saltwater, and harsh chemicals, along with high durability and strong formability and weldability, it delivers reliable performance in tough environments.



ENERGY

Metal additive production
of sampling valves

JOME Engineering replaced casting with WAAM to produce a SS316L sampling valve body for oil & gas applications.

Printed in 7.5 hours with Vipra AM (20.5 kg, 220 × 310 × 220 mm, 5 bar line pressure), the part went from file to finished component in under 48 hours instead of ~60 days, cutting lead time by up to 90% with near-net-shape quality that minimized machining and waste.

Al2319
Aluminum Alloy

This high-strength material is ideal for aerospace components exposed to elevated temperatures, offering excellent mechanical properties after heat treatment. It's used in aerospace (fuselage, fuel tanks), automotive (suspension, chassis), and energy (storage tanks). With high mechanical strength for stress applications, wear resistance, and cavitation resistance, it performs well in demanding environments.



AEROSPACE

Pressurized tanks for space

D-Orbit adopted WAAM to develop a pressurized aluminum tank for carrier satellites that deploy CubeSats into orbit. The component was built with no assembly required, using MIG-based WAAM with proprietary 8-axis slicing and control software, all within a fully integrated digital workflow connecting design, production, and testing.

Compared to conventional routes, the approach delivered greater design freedom, lighter optimized structures (lowering launch costs), reduced material waste, and shorter lead times for low-volume, high-value space components.

Invar 36
Iron-Nickel Alloy

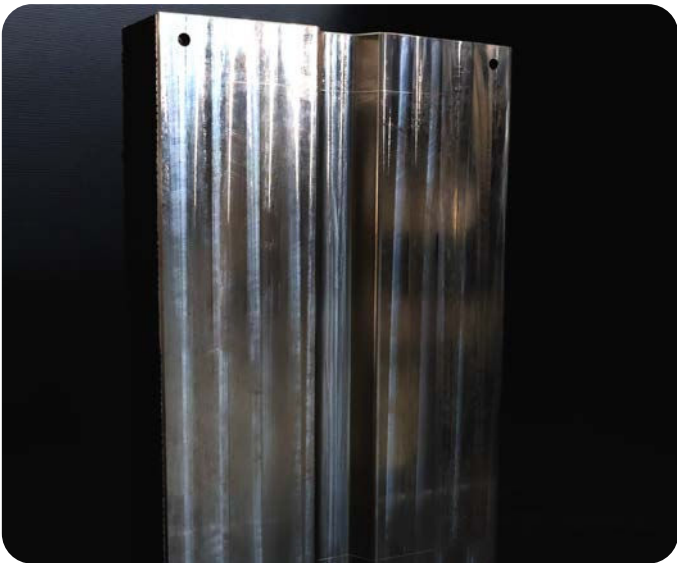
This iron-nickel alloy has a very low coefficient of thermal expansion, making it ideal for precision instruments and applications that require dimensional stability across a wide temperature range. It's used in aerospace tooling, precision molds, and cryogenic storage tanks. With minimal thermal expansion, excellent stability, and good toughness, it's perfect for temperature-sensitive environments.

AEROSPACE & TOOLING

High-precision autoclave cure tools

A high-precision stringer mold for curing stiffened composite fuselage panels was produced with Vipra AM in Invar 36.

The tool (580 × 600 × 230 mm, 70 kg) was printed in 14 hours at a deposition rate of 5 kg/h, then CNC machined. Compared to casting or machining from billet, the additive route cut lead times significantly while delivering a mold that holds tight tolerances over repeated thermal cycles without warping.



ER70S-6
Steel

It's suitable for WAAM deposition of medium-strength structural steels, with mechanical performance comparable to steels such as S460. It can be used for structural components, repair operations, large steel parts, tooling, frames and general fabrication where good toughness and weldability are required. The deposited material offers a good balance of strength, ductility and process stability.

Inconel 625
Nickel-based Superalloy

This nickel-based superalloy offers outstanding strength, fatigue, and corrosion resistance across a wide temperature range (cryogenic to 900°C). It's used in aerospace, chemical, and power generation. With high strength for high-stress, high-temp applications, excellent corrosion resistance, thermal stability up to 982°C, and versatile use, it's ideal for demanding environments.

ENERGY

Multi-material neck flange

A multi-material neck flange for oil & gas applications was produced with Vipra AM, combining two metals in a single part: Inconel 625 in high-stress, high-corrosion areas and ER70S steel in less critical regions.

This selective material placement delivers the corrosion and temperature resistance needed for oil platforms, subsea systems, and high-temperature piping, while keeping costs down by limiting the expensive superalloy to where it's actually needed.

The part (270 × 270 × 110 mm, 14 kg) was printed in 3 hours at 5 kg/h and finished by CNC machining.



17-4 PH
Stainless Steel

This precipitation-hardening stainless steel combines high strength, hardness, and corrosion resistance, making it ideal for high-performance parts.

It's used in aerospace (landing gear, turbine blades), chemicals (valves, pumps), nuclear (control rods), and general engineering (shafts, gears). With excellent mechanical properties, resistance to chloride cracking, and heat treatability for customized properties, it's a reliable choice for demanding applications.

CuAl8Ni6
Copper Alloy

This copper-aluminum-nickel alloy offers excellent corrosion resistance, high strength, and good wear resistance, making it ideal for harsh marine and industrial environments. It's used in marine (propellers, pumps), oil & gas (valve seats, impellers), industrial machinery (bearings, gears), and power/chemical sectors (blades, screws). With strong corrosion, wear, and cavitation resistance, it's perfect for high-stress, demanding applications.



MARINE

Marine propeller manufacturing

The propeller (750 × 750 × 270 mm, 45 kg) was printed in 10.5 hours at 4.6 kg/h and finished by CNC machining.

Compared to traditional casting, the additive route enabled fully custom blade geometries, faster on-demand turnaround, and significantly less material waste, while the alloy ensures a long service life even in aggressive saltwater conditions.

410 NiMo
Stainless Steel

This martensitic stainless-steel alloy, with nickel and molybdenum, offers high strength, toughness, and excellent corrosion and wear resistance. It's ideal for oil & gas (pump shafts, valves), and industrial machinery (cutting tools, bearings).

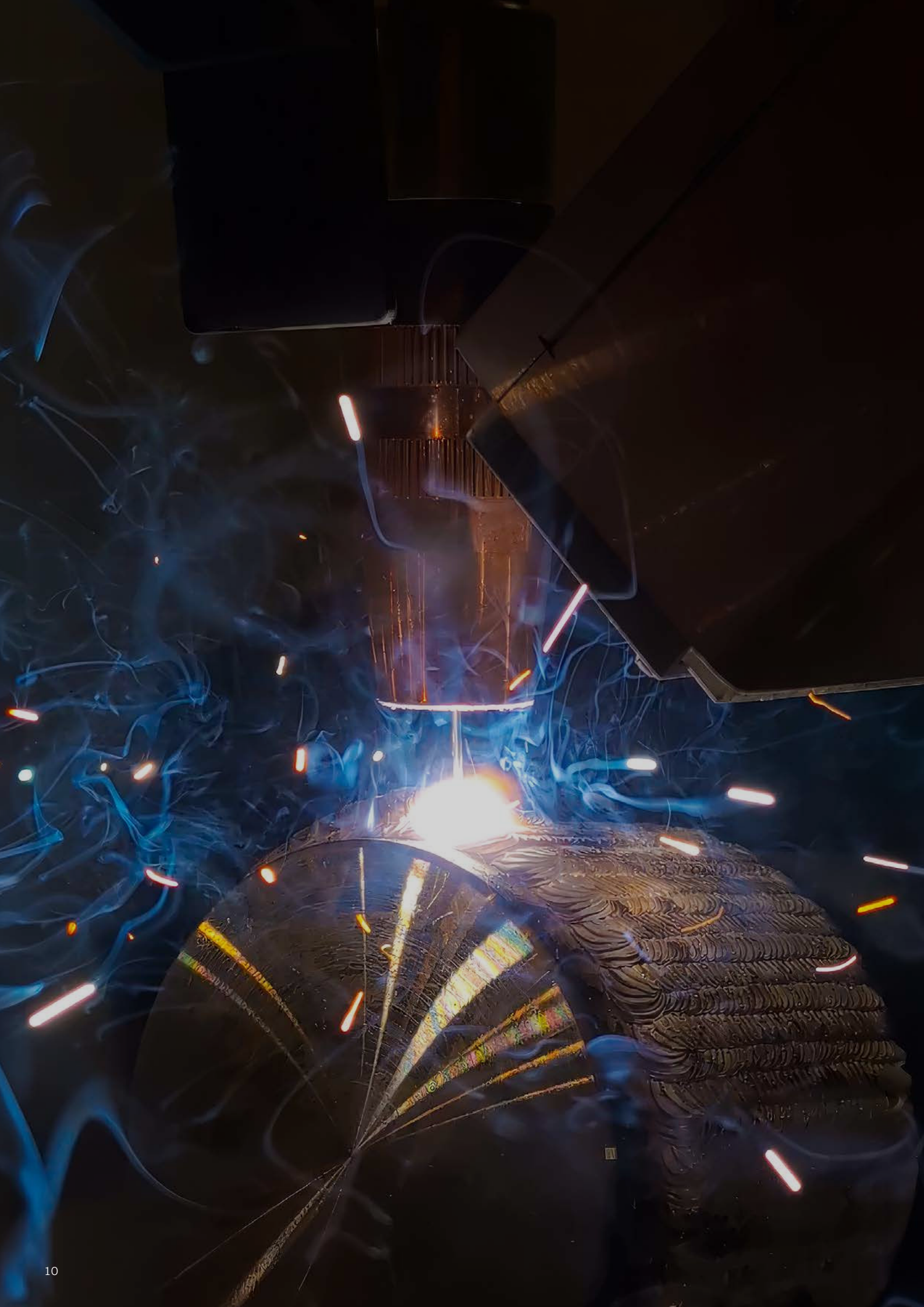
With resistance to water, chemicals, and mild acids, it withstands mechanical stress, resists wear and is easily machined for precise finishes.

Al6061
Aluminum Alloy

It's a precipitation-hardenable Al-Mg-Si alloy, widely used for lightweight structural applications. It is commonly used for aerospace and industrial components requiring a good balance of strength, corrosion resistance, and processability. In a WAAM context using welding wire, AA6061 is particularly attractive because it can provide good manufacturability and relatively high mechanical performance after appropriate heat treatment.

Al7075
Aluminum Alloy

It's a high-strength Al-Zn-Mg-Cu alloy, widely used for demanding lightweight structural applications. It is commonly selected for aerospace, tooling, and highly loaded components where maximum strength-to-weight ratio is required. It is particularly attractive for its high mechanical potential.



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.

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