

FLUID POWER SOLUTIONS

Additive Manufacturing



we create for you



Aidro



In **1982**, Aidro was founded by Mr. Paolo Tirelli, an Italian engineer with a vast experience in the hydraulics sector.

During **2006**, Aidro received the Quality Certification ISO 9001 for the design and production of hydraulic valves and components.

Thanks to the success of its activities, in **2009** Aidro established a new headquarters in Taino (Varese).

In **2012** Valeria Tirelli succeeded her father as CEO of Aidro. Starting from **2017**, Aidro introduced the new technology Additive Manufacturing, enabling the production of Metal 3D Printed products in the hydraulics sector.

In **2018**, Aidro adopted new Quality Management Systems and received AS/EN 9100 Certification, for Hydraulics and Additive Manufacturing.

The company, now led by the siblings Tommaso and Valeria Tirelli, has expanded its activity to other sectors like aerospace, energy and oil&gas.

In **2021** Aidro joined Desktop Metal group to grow in fluid power with Additive Manufacturing and to boost the adoption of AM in aerospace and energy sector.

In **2022** Aidro celebrated its 40th anniversary

Qualifications



MANAGEMENT SYSTEM CERTIFICATE

Certificate no.: 271807-0118-AD-ITA ACCREDIA Initial certification date: 29 October 2018 Issue Date: 29 October 2021 Expiry Date: 28 October 2024

This is to certify that the management system of
A.I.D.R.O. S.r.l.
Via Prati Bassi, 36 - 21020 Taino (VA) - Italy

has been found to conform to the Quality Management System standards:
EN 9100:2018 and ISO 9001:2015
(technically equivalent to AS9100B and JISQ9100:2016)

and has been audited in accordance with the requirements of EN 9104-001:2013 and ACCREDIA Technical Regulation RT-18.

Type of certification structure: Single Site

This certificate is valid for the following scope:

Design, manufacture and trade of control valves and components for the adjustments and the control of hydraulic systems and parts produced by additive manufacturing.
Progettazione, fabbricazione e commercializzazione di valvole e componenti di regolazione e controllo per applicazioni oleodinamiche e particolari realizzati mediante tecnologie additive.

Sector IAF: 17, 18, 19



Statement of Approval No. : LH/1782

This is to Certify that

AIDRO-

**VIA PRATI BASSI 36
21020 TAINO VA
ITALY**

is hereby approved as a Supplier to

Leonardo Helicopters

in accordance with QRS01 'Quality Requirements for Suppliers',
the scope of which is defined within the attached
Scope of Approval

Date of Issue: 29 September 2021



CERTIFICATE OF QUALIFICATION

Document No:
COCQ0303800

This is to certify:

That
Aidro Srl
Via Prati Bassi, 36, 21020 Taino VA, Italy
is a qualified manufacturer of:

Additive Manufacturing of metallic parts

in accordance with
DNV-Q1-B200 and DNV-SE-0509 Module B
and the following particulars:

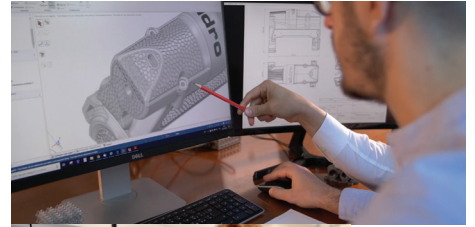
AM Facility qualified	Aidro Srl, Via Prati Bassi, 36, 21020 Taino VA, Italy
AM Technologies qualified	1. Laser beam powder bed fusion (PBF-LB) to AMC 3 level 2. Binder jetting technology (BJT) to AMC 1 level
BPOs qualified	1. AM Stainless Steel Alloy (UNS S31605) for PBF-LB 2. AM Precipitation-Hardening Stainless Steel (UNS S17400) for BJT
Parts qualified	1. Valve body, AMC 3 level as per manufacturer's own specification, PBF-LB and UNS S31603 material, see PPS for details.

Reference documents:
Facility description: FD.01 Rev. 01
Audit report: 10005900A Rev. 01 & Audit.01 issue 1
BPO records: BPOCR.001 Rev. 1.5
PQ records: PQR.001 issue 1 & PPS.001 issue 1

Activities

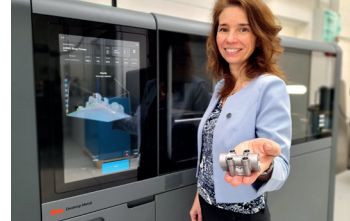
Design

Design for Additive Manufacturing allows complex geometries, lightweight solutions, space saving and integration of multiple parts into one.



Production

Additive Manufacturing Department offers various metal 3D printing technologies, as Laser Powder Bed Fusion and Binder Jetting by Desktop Metal.



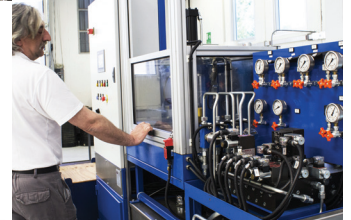
Testing

Aidro provides a wide range of tests on material properties, pressure resistance, mechanical and micro-structural properties, non-destructive test, functional test and dimensional 3D scan control.



Research & Development Fast-Prototype

Additive Manufacturing enables the development of new products and fast prototypes in a short delivery time.



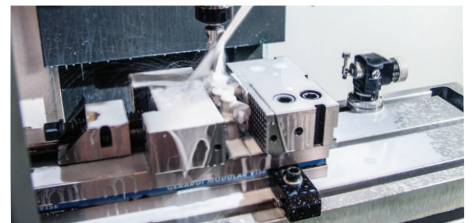
Process Qualification

Quality Management System EN/AS 9100 and Process Qualification in accord to API20S, DNV ST-B203 and customers specifications.



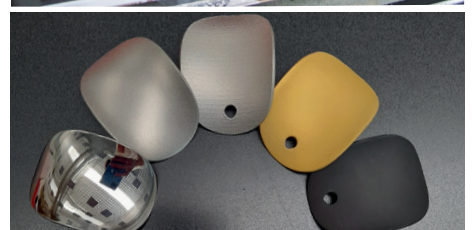
CNC finishing

Machining of cavities, surfaces finishing and other post-processing are available for 3D printed parts.



Post Treatment

Heat treatment of 3D metal printed parts, surface finishing, coating.





Additive Manufacturing in Hydraulics

Aidro has incorporated Additive Manufacturing (or Metal 3D Printing) into its manufacturing processes, to create a new generation of hydraulic solutions, innovative parts and to overcome the limits of conventional manufacturing methods. This technology allows to produce fast prototypes, spare parts and functional products

with the following advantages:

- lightweight and space saving
- complex geometries at no extra cost
- better performances thanks to the optimization of the internal channels, curved shapes and elimination of 90 Degrees intersection angles
- reduced risk of leakage, absence of auxiliary plugs
- fast lead time

Two Additive Technologies:

Laser Powder Bed Fusion (PBF-LB, DMLS) starting from a digital file, metal powder particles are melted using a high power laser in sequential ultra-thin layers, creating functional 3D parts.

Metal Binder Jetting (MBJ) using finest metal powder, the parts are produced in a short time and with mass-customized volumes.



from



to

3D Printing
BENEFITS



60%
Weight
reduction

Traditional production

Metal 3D printing

High Quality Metal Powders

Inconel (625, 718) is a heat and corrosion resistant nickel alloy characterized by having high tensile, creep and rupture strength. Components in this type of nickel alloy have typically excellent fatigue and thermal-fatigue values.

Stainless steel (AISI316L, 17 4-PH) is characterized by having good corrosion resistance and mechanical properties. This is widely used for hydraulic special applications, such as oil&gas, off-shore and marine.

Aluminum (AlSi10Mg, F357) offers good strength, hardness and dynamic properties and it is also used for parts subject to high loads. It is ideal for applications that require good thermal properties and reduced weight.

Maraging Steel is known for possessing superior strength and toughness without losing malleability. The hydraulic parts made from this steel are easily machinable after the 3D printing process.

3D Printed Products



Valve Body

- CETOP valves with a wide range of available size (CETOP2, CETOP3,...)
- Lightweight compared to the conventional manufacturing
- High quality materials with corrosion resistance
- Annular chambers for reduced pressure drops



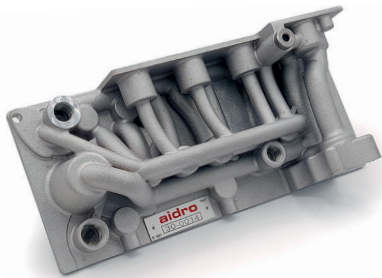
Overcenter Valve

- Optimized flow paths for improved performances
- Extreme stability on full working range
- No more need of auxiliary caps and plugs
- Reduced risk of leakage
- The lowest weight valve in the class



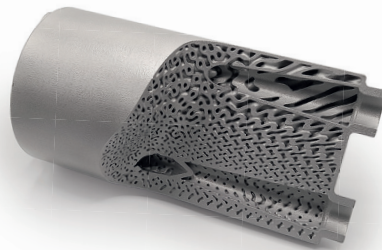
Bankable Valves

- Optimized internal flow paths for improved performances
- Optional modules can be assembled with the system or directly integrated in one body
- Suitable for the harshest environments



Hydraulic Manifold

- Extreme weight reduction
- Low pressure drops
- No more need of service plugs
- Channels optimization
- High pressure resistance (700 bar or 10,000 psi)



Heat Exchanger

- Design freedom
- Possibility to produce complex geometries
- High customization
- Space saving
- High heat transfer and performance



Small Components

- Good material properties
- Fast delivery time
- Custom-made products
- Mass-production volume



CETOP valve AMES



Additive manufactured valve body offers a significant weight reduction and an increased performance thanks to the improved flow path in the internal channels, granting a reduced pressure drop. Available sizes: HD2-CETOP2, HD3-CETOP3.

3D Printing BENEFITS



65%
Weight
reduction

- Lightweight compared to the conventional manufacturing
- High quality materials with corrosion resistance
- Annular chambers for reduced pressure drops
- Fast delivery time



from

Traditional production

Material: Cast Iron
Weight: 0,6 Kg



to

Metal 3D printing

Material: Stainless Steel
Weight: 0,2 Kg

Overcenter valve



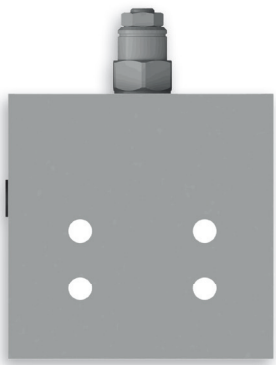
Overcenter valve (also known as counterbalance or load holding valve) is substantially a pilot assisted relief valve with an integral free flow check. It is normally used for load holding, load control or load safety, depending on the application.

3D Printing BENEFITS



80%
Weight
reduction

- Optimized flow paths for improved performance
- The lowest weight valve in the class
- Extreme stability on full working range
- No more need of auxiliary plugs and caps
- Reduced risk of leakage



from

Traditional production

Material: Steel
Weight: 2,6 Kg

Material: Aluminum
Weight: 0,9 Kg



to

Metal 3D printing

Material: Stainless Steel
Weight: 0,5 Kg

Material: Aluminum
Weight: 0,2 Kg



Bankable valve HDF-AMES



Bankable valve offers a significant weight and volume reduction compared to the conventional valve. The increased performance is possible thanks to the improved flow path in the internal channels, granting a reduced pressure drop. Stackable horizontal and vertical modules are available.

3D Printing BENEFITS



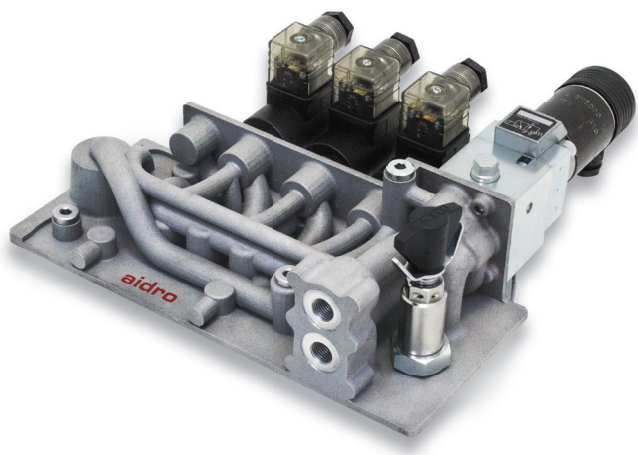
3D Printing BENEFITS

- Optimized internal flow paths for improved performances
- Bodies can be custom made integrating any specific customer's functions
- Suitable for the harshest environments
- Better time-to-market

A wide range of optional elements are available and can be integrated within the system. Working sections are available with ON/OFF or proportional control and with parallel or series circuit.

- Feasibility of geometric forms impossible with traditional machine
- Better performance than the traditional manufacturing
- Ability to combine multiple parts into one
- Optional modules can be assembled with the system or directly integrated in one body

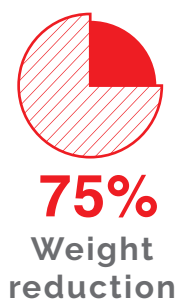
High Pressure Hydraulic Manifold



This 3D printed Hydraulic Manifold is designed for high pressure (700 bar 10,000 psi).

The material is Aluminum (class 6000 equivalent) and compared to the conventional manifold the weight reduction is 75%.

3D Printing BENEFITS



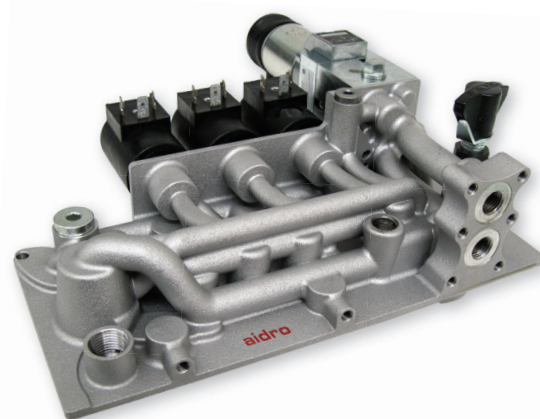
- Optimized performances, thanks to curved channels and no more 90 degrees intersection angles
- Good material properties
- Lightweight solutions
- High pressure resistance



from

Traditional production

Material: Aluminium Ergal
Weight: 5 Kg



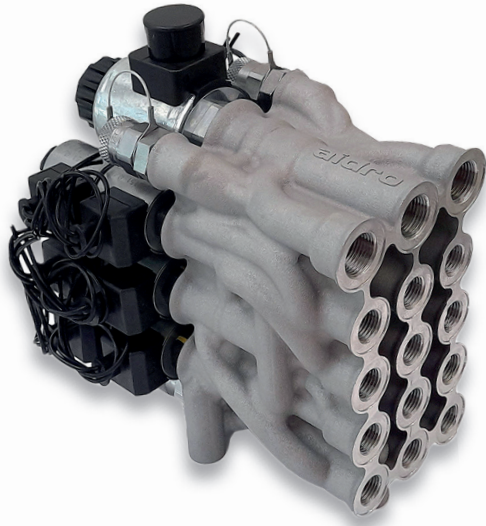
to

Metal 3D printing

Material: Aluminium AlSi10Mg
Weight: 1,3 Kg



Hydraulic System



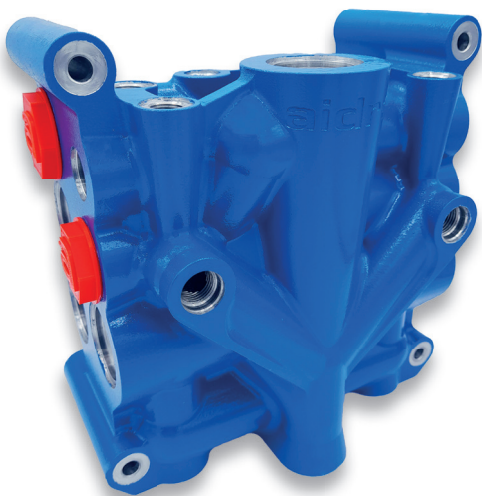
This 3D printed Hydraulic System is a lightweight solution for lifting and construction equipments. It is made with Aluminum and compared to the conventional manifold the weight reduction is 70% (from 15,5 Kg to 4,5 Kg).

3D Printing BENEFITS



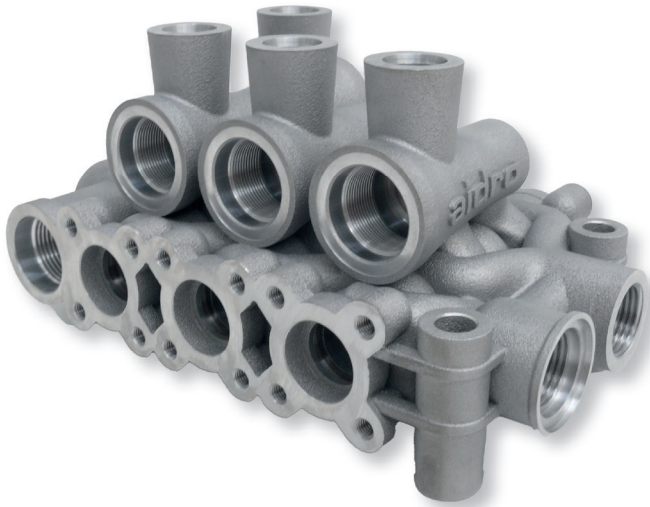
70%
Weight
reduction

- Optimized performances, thanks to curved channels and no more 90 degrees intersection angles
- Integration of multiple components into one
- Lightweight solutions, with 70% weight reduction



The lightweight material makes this manifold ideal for high-speed racing boat applications. The Design for Additive Manufacturing allows the creation of complex geometries, lightweight structures and improved performance. The customized design was made for the trimaran boat of Mediterranean sail crossing.

Combo hydraulic manifold



This 3D printed hydraulic manifold is the combination of hydraulic block and the three valves on the top.

With Additive Manufacturing is possible to combine multiple parts into one.

Compared to the conventional manifold [1] the weight reduction is 90% for the complete 3D printed solution [3].

3D Printing BENEFITS

- Combining multiple parts into one
- Lightweight solutions
- Lower pressure drops thanks to channels optimization
- Reduced risk of leakage



Conventional Hydraulic
Manifold



Metal 3D printing



3D Printed Hydraulic Manifold
and Valves (single piece)



Lightweight hydraulic manifold



"Winner of Additive World Challenge 2018"

Aidro designed an innovative hydraulic block for mobile application and the jury of Additive Conference has nominated it the Winner of the Additive World Challenge 2018.

The redesign hydraulic manifold consolidated two parts into one, it is smaller than its predecessor, and has an optimized flow because of improved, curved channels. Moreover, the problem of leakage, caused by auxiliary plug failure, is eliminated and the weight is reduced by an impressive 70%.

3D Printing BENEFITS



70%
Weight
reduction

- Better performance than the traditional manufacturing
- Ability to combine multiple parts into one
- Internal channels optimization



from

Traditional production



to

Metal 3D printing

Heat exchanger



Additive manufacturing is suitable for the re-design and production of Heat Exchanger. In the photos there are two examples of water-oil heat exchangers made with Additive Manufacturing in Aluminum (AlSi10Mg).

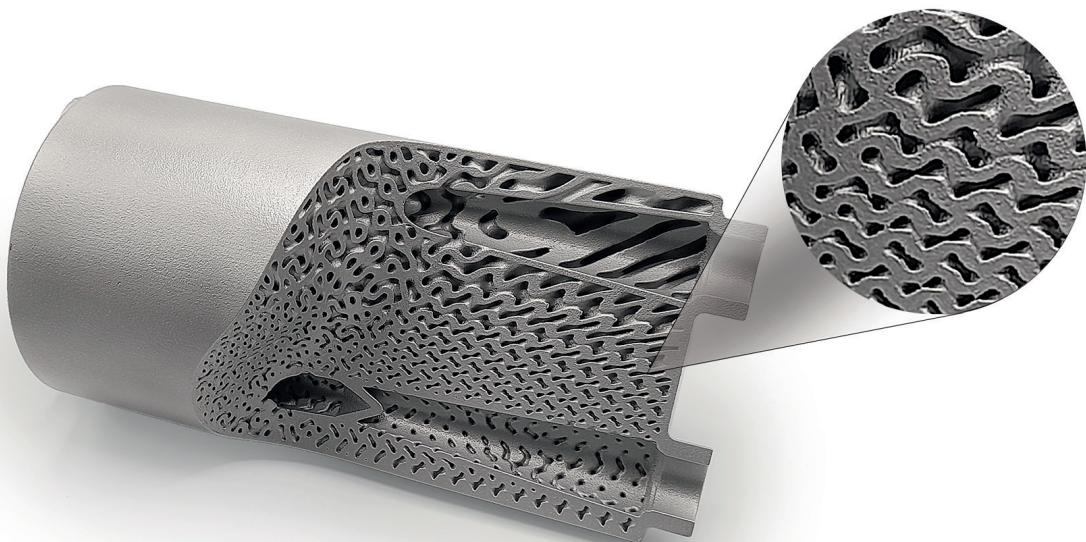
The main advantages are the weight reduction and the compactness compared to the traditional heat exchanger. With Additive Manufacturing it is possible to improve the performance thanks to innovative shapes, micro galleries, gyroid surface at variable frequency.



**"Winner of Purmundus Awards"
Formnext 2021**

3D Printing BENEFITS

- High performances in small size
- Possibility to combine multiple parts into one
- Weight saving till 85%





Small Components

Spool



This spool has been redesigned in order to be 3D printed with new holes forms, such as oval holes and square holes. These shapes are impossible with traditional manufacturing, in particular with CNC machining, while with additive manufacturing complex geometries are now feasible.

Indeed, with the new holes forms, the idea is to increase the passing area of oil inside the spool, allowing lower pressure drop. Therefore, the new design with additive manufacturing offers an higher performance. Moreover, with the ability to build complex geometries, more components are integrated into one piece and 3D printed spool is one single part. This allows to simplify the manufacturing process and reduce assembly time.

3D Printings BENEFITS

- Feasibility of geometric forms impossible with traditional machine
- Ability to combine multiple parts into one
- Better performance than the traditional manufacturing

Plug



This plug is 3D printed in stainless steel with Binder Jetting technology by Desktop Metal

Plugs can be fully customized and threads do not require CNC machining.



Sustainability

Aidro supports customers in their journey into sustainability and carbon footprint reduction. Sustainability is at the core of everything we do.

Society has to move towards net-zero emissions, and we aim to be a committed partner on that journey.

Our goal is to improve our products' quality and efficiency in respect of nature, and to make a positive change towards sustainable production and environment.



Green Powder from the Recycling of Obsolete Parts

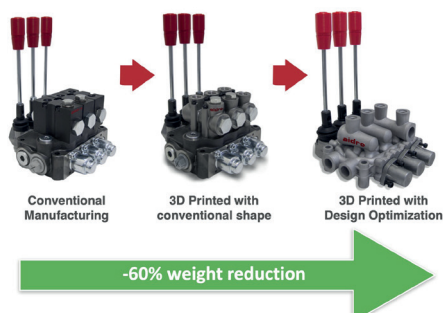
Aidro is a proudly partner of the GREEN powder project made with the recycling of obsolete parts by our partners.

This project marks a milestone towards the circular economy :

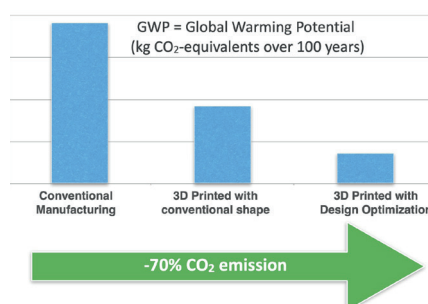
- recycle obsolete parts from "dead stock"
- create metal powder for 3D printing
- design for AM and 3D print new components at lower CO2 footprint
- giving new life to scrap metals

Aidro supports its clients in their Carbon Footprint Reduction plans with the supply of 3D printed parts made with Green Powder

Additive Manufacturing



Life Cycle Assessment



aidro

Desktop Metal Company

Operative Address and Warehouse:

aidro s.r.l.

Via Prati Bassi 36- 21020 Taino (VA) Italy

Phone: +39 0331 960250 - Fax: +39 0331 960075

email: aidro@aidro.it



member of:



Copyright © 2023 - Aidro srl

3D metal printing hydraulic solutions