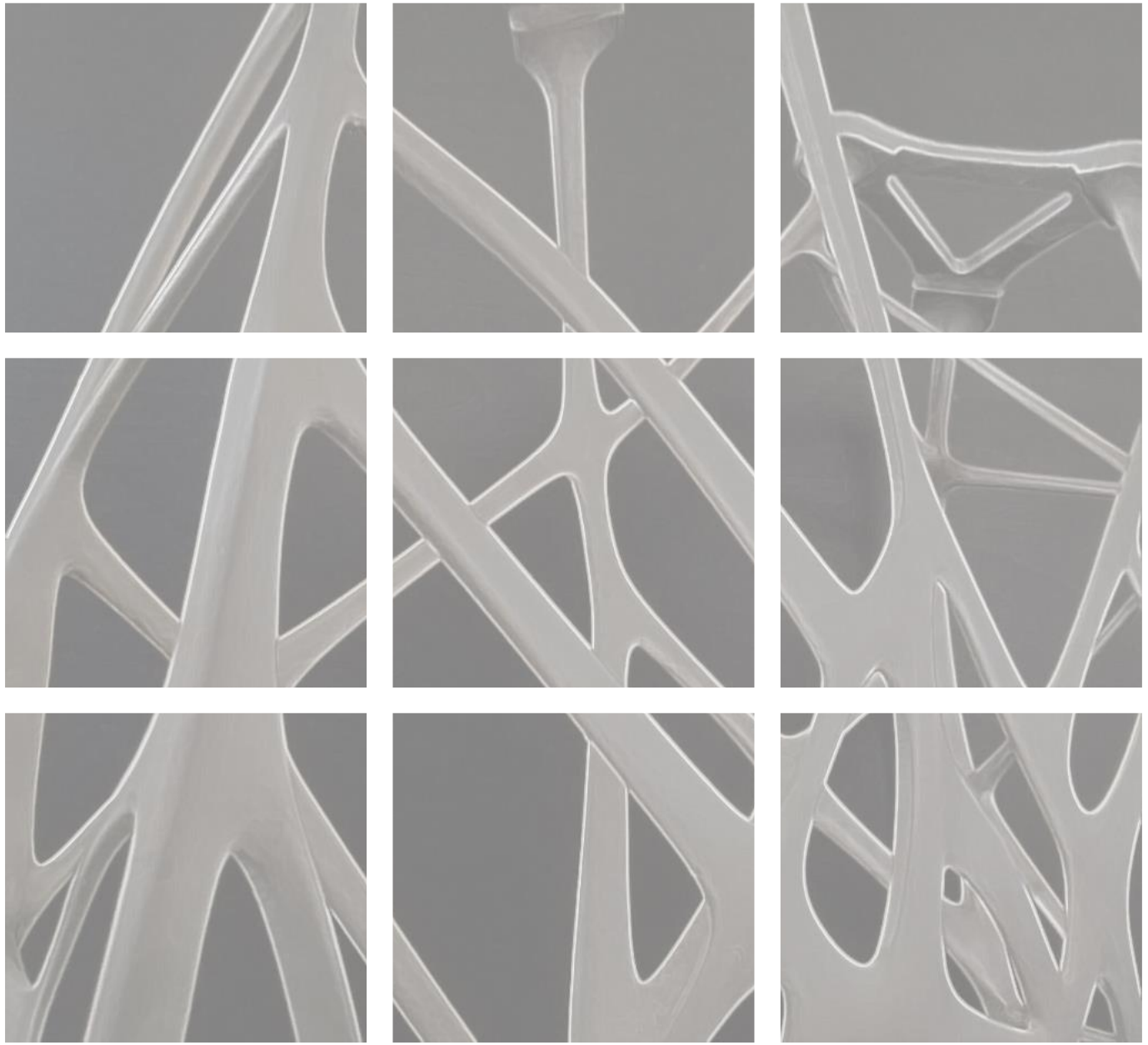
ADD-ASTRA

LIMITLESS MATERIA INNOVATION

Company Profile



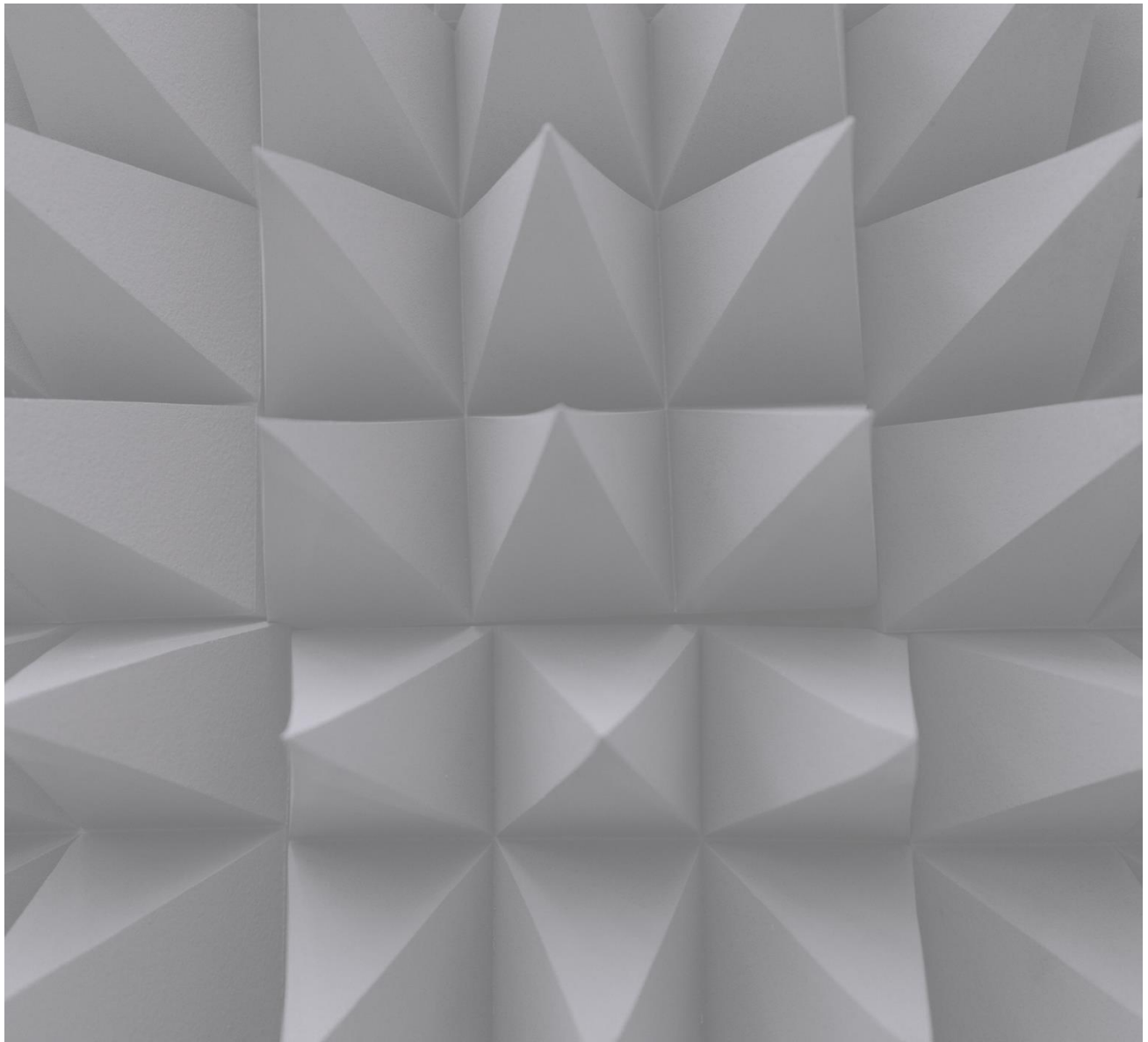
WHO WE ARE

ADD-ASTRA SRL is an innovative start-up based in Modena, born out of Controllo Qualità srl additive manufacturing division, with the aim to support firms in the development of new materials for additive manufacturing industry.

MISSION

Our daily mission is to provide cutting-edge services aimed at improving efficiency in Additive Manufacturing processes. The company is primarily focused on custom polymer and metal materials for FDM, SLS and SLM technologies, and some applications of Graphene in 3D printing processes.

OUR SERVICES



Optimization and production of customized components through additive-based technologies

Research and Development, Technology Transfer and Metal Replacement

3D printing of technopolymers

OUR APPROACH

All Project Milestones managed by only one player

Cycle full integration and optimization of product development

Focus on customer's goals

Modular Activation

✓ Simplification for the customer

✓ Lead time reduction

✓ Efficiency improvement and process optimization

✓ Higher value, Lower cost

R&D AND SCOUTING

Custom materials for special applications

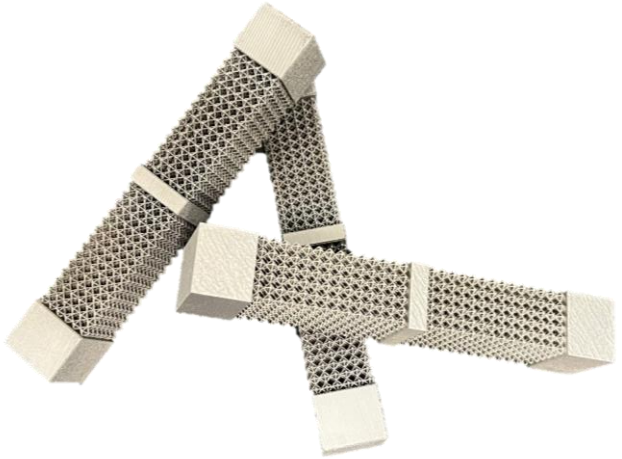
Qualification of innovative materials through a rigorous scientific approach, following a certified process.

Material consultancy

Technical support for material selection for new projects and specific applications.

Consultancy on processes and treatments

Technical support for the revision of materials and treatments for the optimization of operating performance.



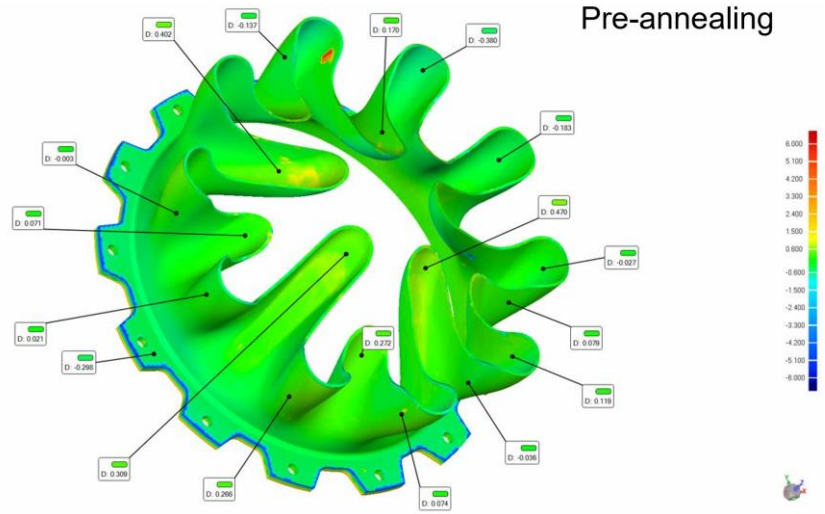
R&D E SCOUTING

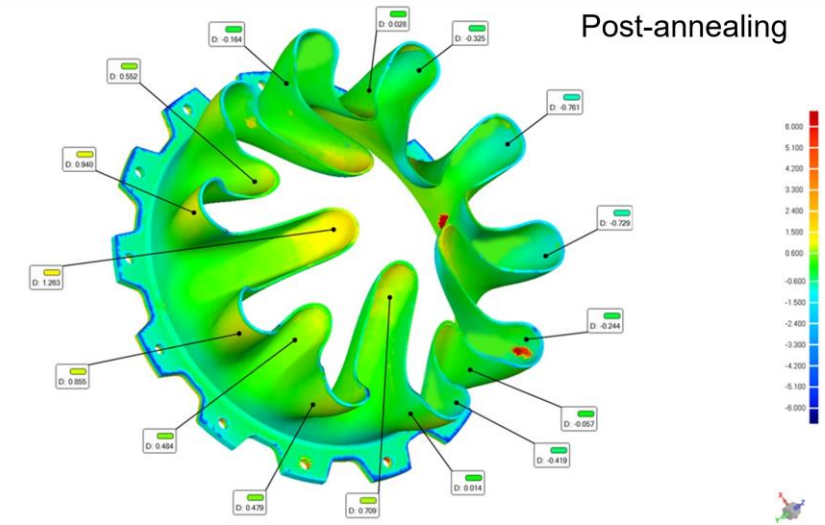
Consultancy on processes and treatments

Effect of thermal-annealing on PAEK polymer

PAEK can be printed amorphous or semicrystalline to exploit the best mechanical, thermal and chemical properties. Amorphous part can be annealed post-printing but is necessary to pay attention to warpage and shrinkage.

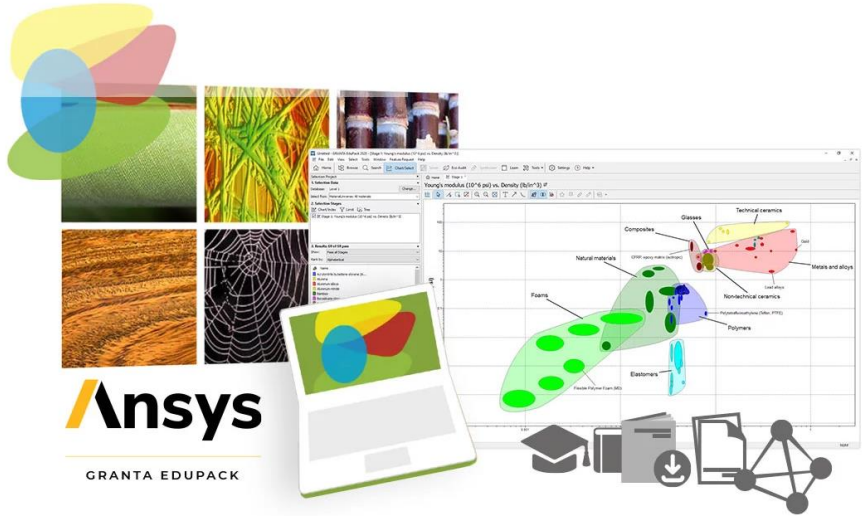
In collaboration with Controllo Qualità Srl we measured the deformation of a part with maximum dimension around 200mm, before and after annealing: the as-printed amorphous item met the general tolerance +/- 0.6mm for the AM technology/material but, after annealing, some critical areas can show an additional deformation, unless a careful design and pre-processing of each 3D part is performed.





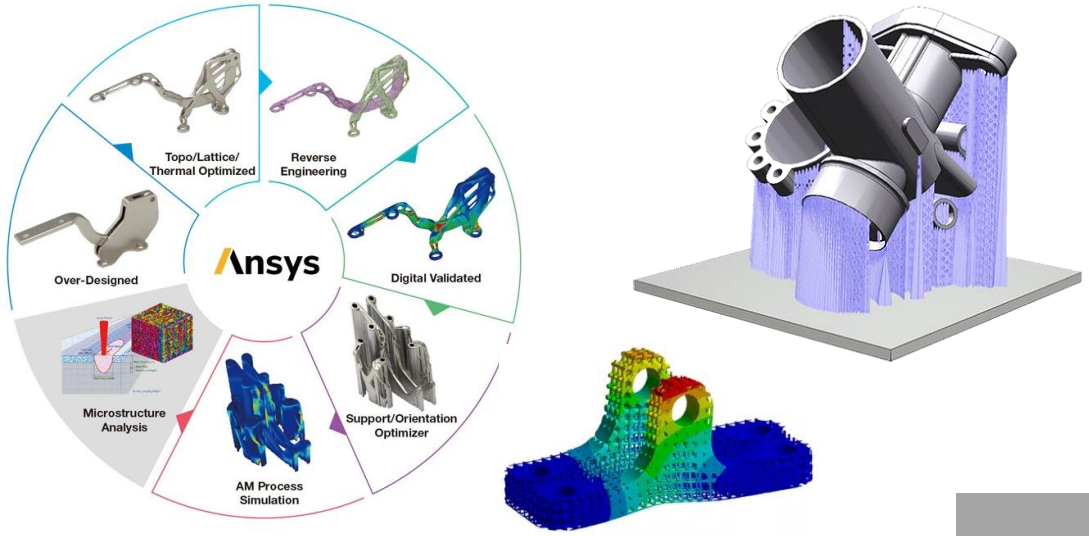
PRE-PRINTING AND 3D MODEL DEFINITION

Design for AM | Simulation | Material selection



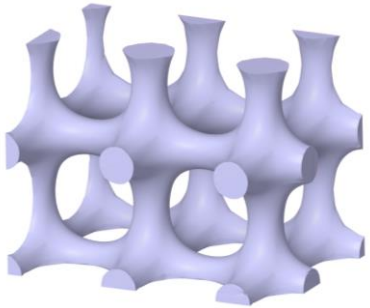
- Design for Additive
- Material selection
- Topological optimization
- Reverse engineering
- Manufacturing and cost analysis

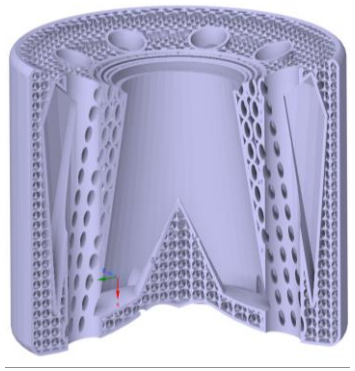
- FEM analysis for wall thickness optimization
- Metal replacement
- Support design for stress residual reduction
- Residual stress prediction
- Complete manufacturing process cycle definition



PRE-PRINTING AND 3D MODEL DEFINITION

Design for AM | Simulation | Material selection

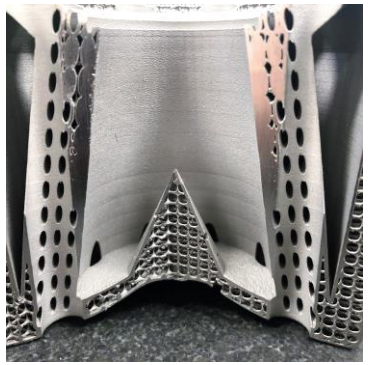


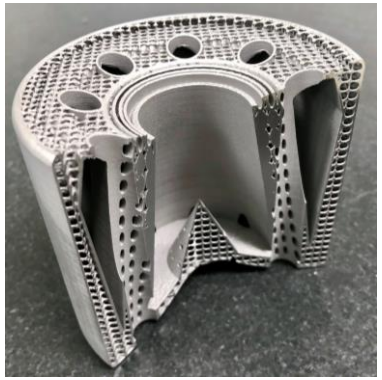


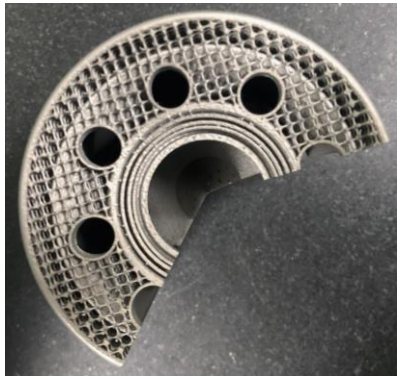
Additive manufacturing (AM) enables the fabrication of strong, lightweight structures with geometry that is unachievable by traditional manufacturing methods, including complex Lattice structures. Lattice structures are topologically ordered, three-dimensional open-celled structures composed of one or more repeating unit cells.

These cells are defined by the dimensions and connectivity of their constituent strut elements, which are connected at specific nodes. At the cellular level, lattice structures can be considered to be structures as far as features and properties are concerned, but behave like homogenized metamaterials when considered at the overall structural level

The design of the structure is developed through dedicated software, capable of analyzing the response of the component to varying load conditions, customizing the macroscopic and mesoscopic properties of the selected material to the maximum. One of the advantages of using Lattice structures is the weight-resistance ratio. Through the Lattice design it is possible to remove material in the least stressed areas of the component, lightening it and thus maximizing its resistance.

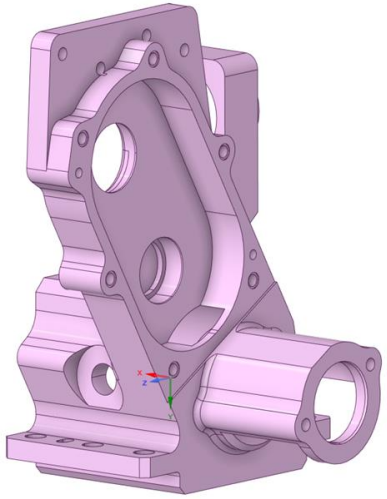


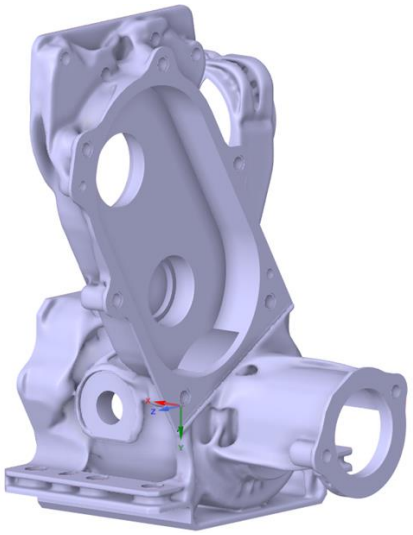




PRE-PRINTING AND 3D MODEL DEFINITION

Design for AM | Simulation | Material selection





Re-design of a differential carter for additive manufacturing technology (SLM) currently made of Al7075 T6 aluminum alloy obtained by CNC machining.

The re-design was carried out to create a more suitable geometry for additive manufacturing (AlSi10Mg material) and reduce weight of the part but maintaining a factor of safety higher than 4.

Following some basic principles of DFAM and considering the requirements of the customer, the optimization of the geometry had been performed and led to two main advantages:

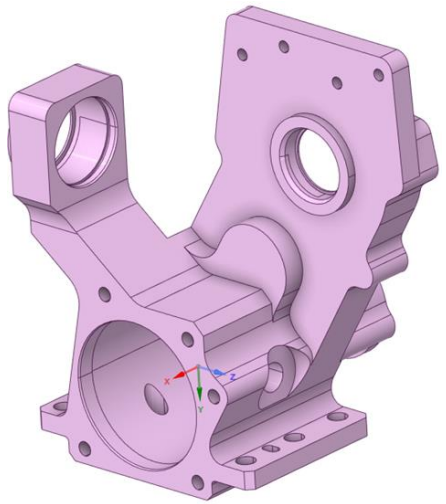
- around 20% reduction of mass (1.07 kg for old geometry vs 0.83 kg for new geometry)

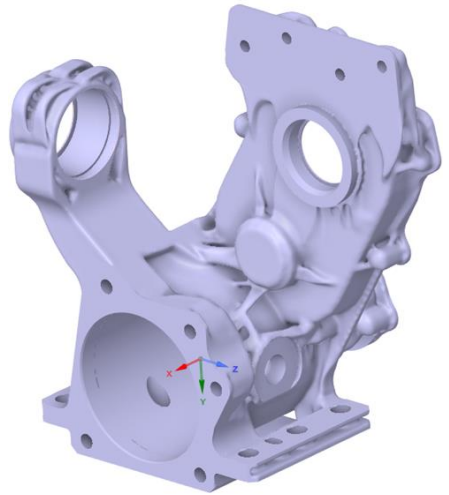
- better printability by SLM technology, with reduction of supports that means saving of time and cost.

The second part of the work involved the complete redesign of the part by means of topological and print optimization.

As a result of optimization, two main benefits are evident:

- 40% weight reduction (from 1,12 Kg of Al7075 T6 to 0,67 Kg of AlSi10Mg)
- 41% increase in factor of safety over the previously optimized geometry (from 8,63 to 14,64)



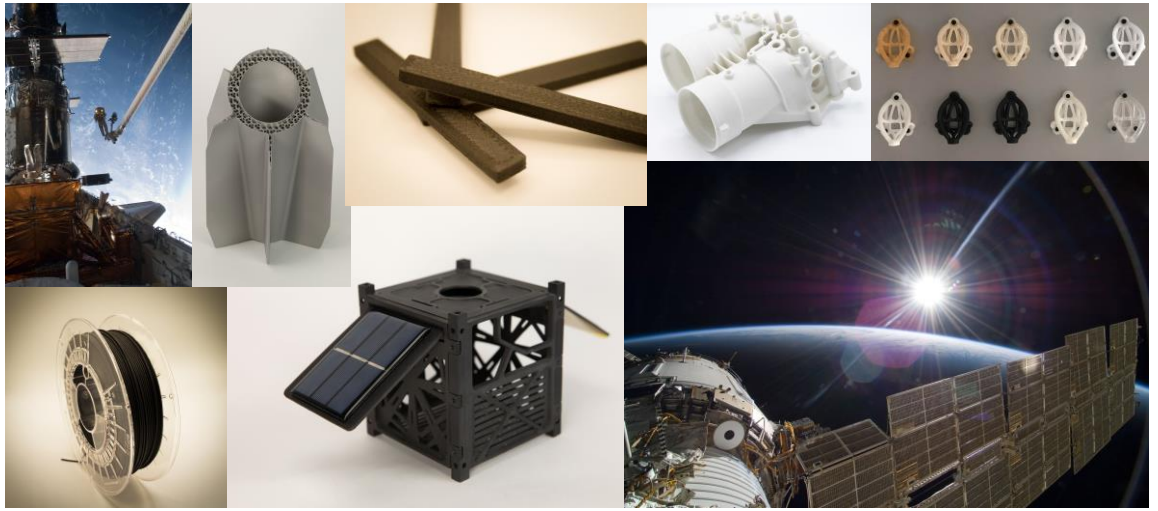


PROCESS AND MATERIAL QUALIFICATION

Advanced industrial applications of components obtained from additive technologies are still limited by the lack of qualification in terms of raw materials and printing technologies.

ADD-ASTRA's innovative services are designed to combine the potential of technologies and materials.

The definition of printing profiles allows, through technology transfer, the qualification and implementation of Additive Manufacturing processes for the production of functional components and metal replacement.



Material characterization

- Mechanical, physical and thermal characterization of polymers
- Mechanical characterization of metals

Special characterizations for demanding applications

- Example: outgassing for Aerospace applications
- Continuous scouting of new partners for challenging characterization
- Coordination of laboratory analyses while respecting the confidentiality of projects under development

PROCESS AND MATERIAL QUALIFICATION

Low outgassing certified material (Ref. Report ESE-RPT-7456-091-INTA-21)

Polymers suitable for applications in the Aviation and Aerospace sectors, processable by additive technologies, are regulated by strict certification and outgassing properties restrict the choice to few materials.
ADD-ASTRA has the main qualified techno-polymers.

OUTGASSING TEST LABORATORY

OUTGASSING SCREENING TEST- *ECSS-Q-ST-70-02C* *(Ed.: 15 Nov. 08)*
(results in advanced report sheet)

ENSAYO Nº/*TEST Nº.:* **DMAV-2140**

Hoja de Resultados nº.: DMAV-21085
/Results sheet nº.:
Date: 12/11/2021

FECHA/*DATE:* 2021, nov - 10

CONDICIONES DE ENSAYO/
TEST CONDITIONS:
-Sample temperature: 125ºC, 24h.
-Condensable collectors temperature: 25ºC, 24h
-High Vacuum: range 10^{-6} - 10^{-7} mbar, 24h
-Air-conditioning of samples: (22+-3)ºC, (55+-10)%HR, 24h before and after the test.

MUESTRA/*SAMPLE*				TML%	RML%	CVCM%	Historial de la muestra/observaciones *History of sample/Remarks*
Nº	Nombre/*Name*	Code/density	Sample cup				
21252	PA1212 FS3300PA		C1	0,833	0,145	0,002	(According to MIC of sample)
			C2	0,820	0,144	0,002	
			C3	0,841	0,156	IR plate	
			$\bar{A}$	**0,831**	**0,148**	**0,002**	
21253	PAEK AM200 Filament		C1	0,189	0,085	0,000	(According to MIC of sample)
			C2	0,186	0,074	0,002	
			C3	0,430	0,330	IR plate	
			$\bar{A}$	**0,268**	**0,163**	**0,001**	
21254	PEI-GF30 Filament		C1	0,406	0,014	0,000	(According to MIC of sample)
			C2	0,401	0,024	0,001	
			C3	0,425	0,022	IR plate	
			$\bar{A}$	**0,411**	**0,020**	**0,000**	
21255	PEKK-A-CF20 Filament		C1	0,350	0,077	0,002	(According to MIC of sample)
			C2	0,338	0,066	0,002	
			C3	0,341	0,082	IR plate	
			$\bar{A}$	**0,343**	**0,075**	**0,002**	
21256	ULTEM AM9085F Filament		C1	0,314	0,034	0,000	(According to MIC of sample)
			C2	0,326	0,022	0,001	
			C3	0,338	0,018	IR plate	
			$\bar{A}$	**0,326**	**0,025**	**0,001**	

OBSERVACIONES/REMARKS:
*The samples tested included in the table are **compliant** with general limits of acceptance for material selection according to ECSS-Q-ST-70-02C: RML < 1,00%, CVCM < 0,10%.*

PROCESS AND MATERIAL QUALIFICATION

Low outgassing certified material

PA12-L 1600 GB is the internally developed SLS powder: based on PA12 powder + glass beads offers improved mechanical properties while maintaining low outgassing.

OUTGASSING TEST LABORATORY

OUTGASSING SCREENING TEST- *ECSS-Q-ST-70-02C* *(Ed.: 15 Nov. 08)*

(results in advanced report sheet-NOT OFFICIAL)

EUROPEAN COOPERATION FOR SPACE STANDARDIZATION

ENSAYO Nº/*TEST Nº.:* **DMAV-2212**

Hoja de Resultados nº.: /*Results sheet nº.:* DMAV-22032

Date: 01/04/2022

FECHA/*DATE:* **2022, mar - 30**

CONDICIONES DE ENSAYO/ *TEST CONDITIONS:*
-Sample temperature: 125ºC, 24h.
-Condensable collectors temperature: 25ºC, 24h
-High Vacuum: range 10^{-6} - 10^{-7} mbar, 24h
-Air-conditioning of samples: (22+-3)ºC, (55+-10)%HR, 24h before and after the test.

MUESTRA/*SAMPLE*				TML%	RML%	CVCM%	Historial de la muestra/observaciones *History of sample/Remarks*
Nº	Nombre/*Name*	Code/density	Sample cup				
22077	PA12-L 1600 GB *(Polyamide PA1212 based + 40% glass beads)*		C1	0,499	0,232	0,010	Manufacturer: SINTERIA SRL (printed parts and mixing PA1212 powder + GB)
			C2	0,490	0,231	0,007	
			C3	0,482	0,232	IR plate	
			Ā	**0,490**	**0,232**	**0,009**	

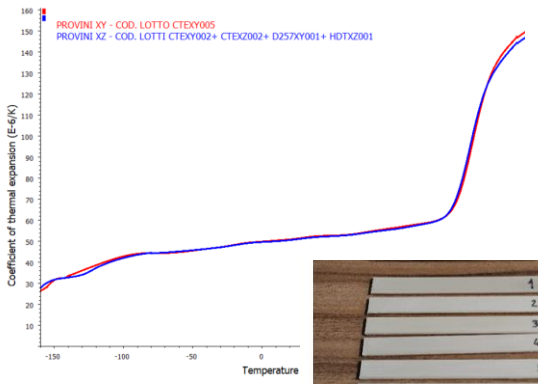
OBSERVACIONES/REMARKS:

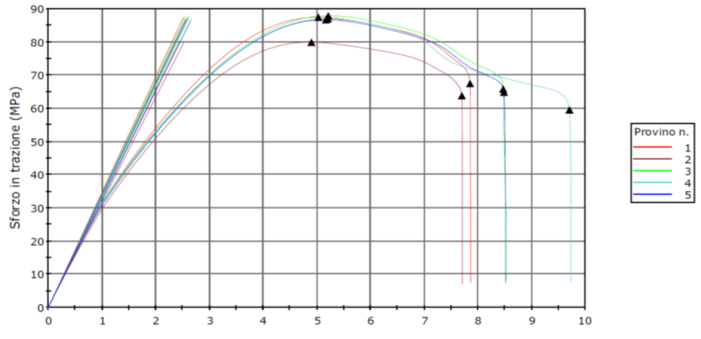
*The sample tested included in the table is **compliant** with general limits of acceptance for material selection according to ECSS-Q-ST-70-02C: RML < 1,00%, CVCM < 0,10%.*

PROCESS AND MATERIAL QUALIFICATION

Which are the main benefits of VICTREX AM™ 200?

- High Performance Polymer applications when you have multiple high demand requirements;
- Excellent mechanical properties over a wide temperature range (also for low-temperature applications);
- Excellent chemical resistance;
- Suitable for space metal replacement;
- Easy-to-print.





Victrex AM™ 200 LMPAEK™ qualification

- Mechanical
- Thermal
- Electrical

Special characterizations for demanding applications

- Tensile, Flexural, Compression
- HDT, DSC, CTE -170°C / 180°C
- Dissipation Factor, Dielectric Costant
- Sheet Resistance, Volume Resistivity
- Outgassing

ADDITIVE MANUFACTURING

Prototyping and Manufacturing

Prodways Promaker P1000
(300x300x330 mm)

PA12
PA12 + GB (Glass Beads, 40%)
PA12 + Graphite/Graphene
(development stage)

GE Concept Laser M2
(250x250x300 mm)

AISI 316L Stainless Steel
AlSi10Mg
AlSc Alloy (development stage)
Pure W

3ntr A2v2 (600x325x500 mm)
3ntr A4v3 (295x295x200 mm)

ABS|ABS ESD|ASA|PC ABS (V0)|PETG|
TPU 85/95 Shore A|PPS|
PA6|PA66 GF30|PA66 CF20|
PEEK (amorphous, development stage)|
PEKK-A CF20 (development stage)|
AquaSys 180|AquaSys 120

…and more

3ntr Spectral 30 (300x300x300mm)

ULTEM 9085|ULTEM 1010|
PEEK|PAEK|PEKK|
PEIGF30 (development stage)|
TPI (development stage)|
AquaSys 180|AquaSys 120

…and more

In collaboration with CONTROLLO QUALITÀ

FINISHING

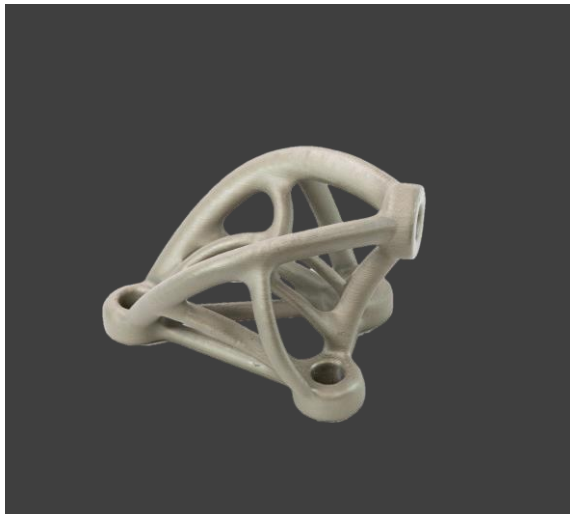
Thermal Treatments

Thermal treatment on Aluminum alloys

Annealing on techno-polymers

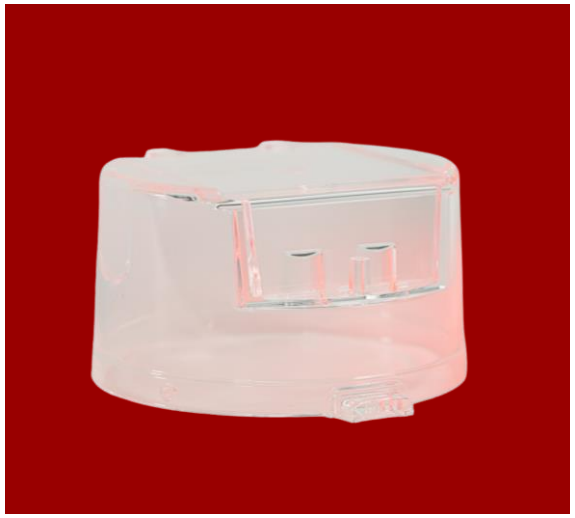
Manual Finishing or Sandblasting

Roughness level up to Ra0.1 on metal and polymer based printed parts



Coating or Painting

Metal plating and Polymer coatings on 3D printed parts



CNC machining

Turning, milling, grinding and electro-erosion on parts made with AM technologies

In collaboration with CONTROLLO QUALITÀ

PART INSPECTION AND VALIDATION

Part Inspection | Part and process validation

Metrological laboratory

3 CMM: Maximum dimensions 3000x1200x1000mm

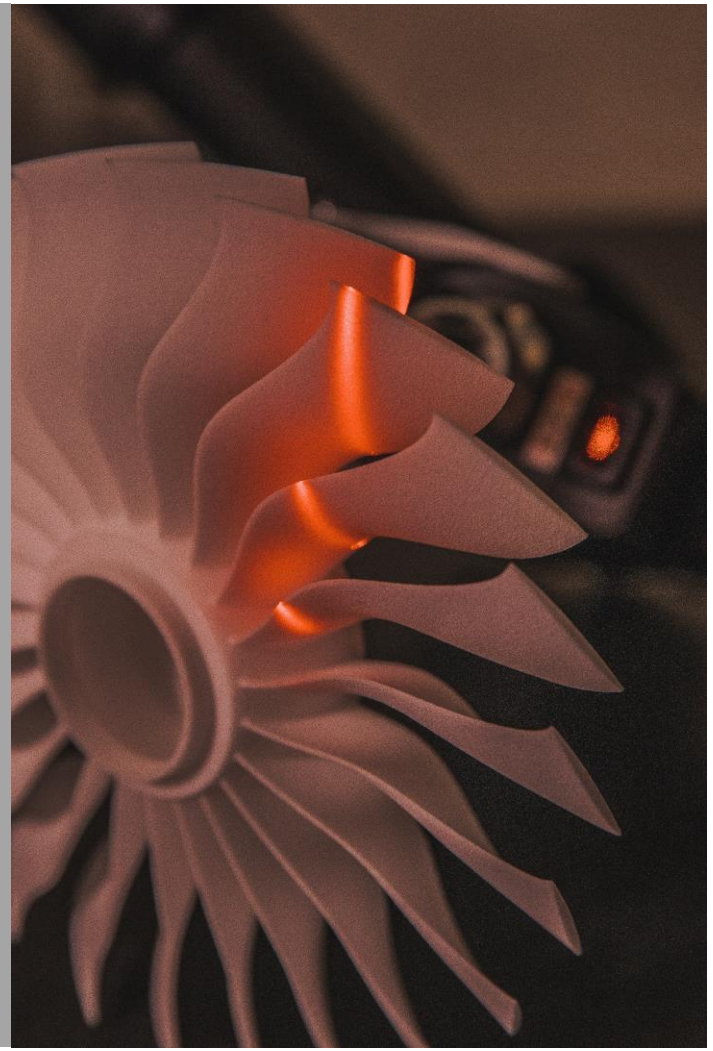
3 ARMS SCAN LASER: Spherical Volume 2500mm

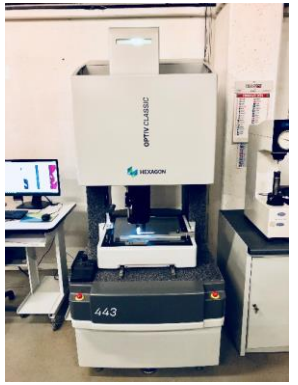
1 LASER TRACKER: Maximum dimensions 40 m

OPTICAL MACHINE: Maximum dimensions 400x400x300mm

PROFILOMETER: 120mm stroke

TOOLS: Equipped with different traditional instrumentation

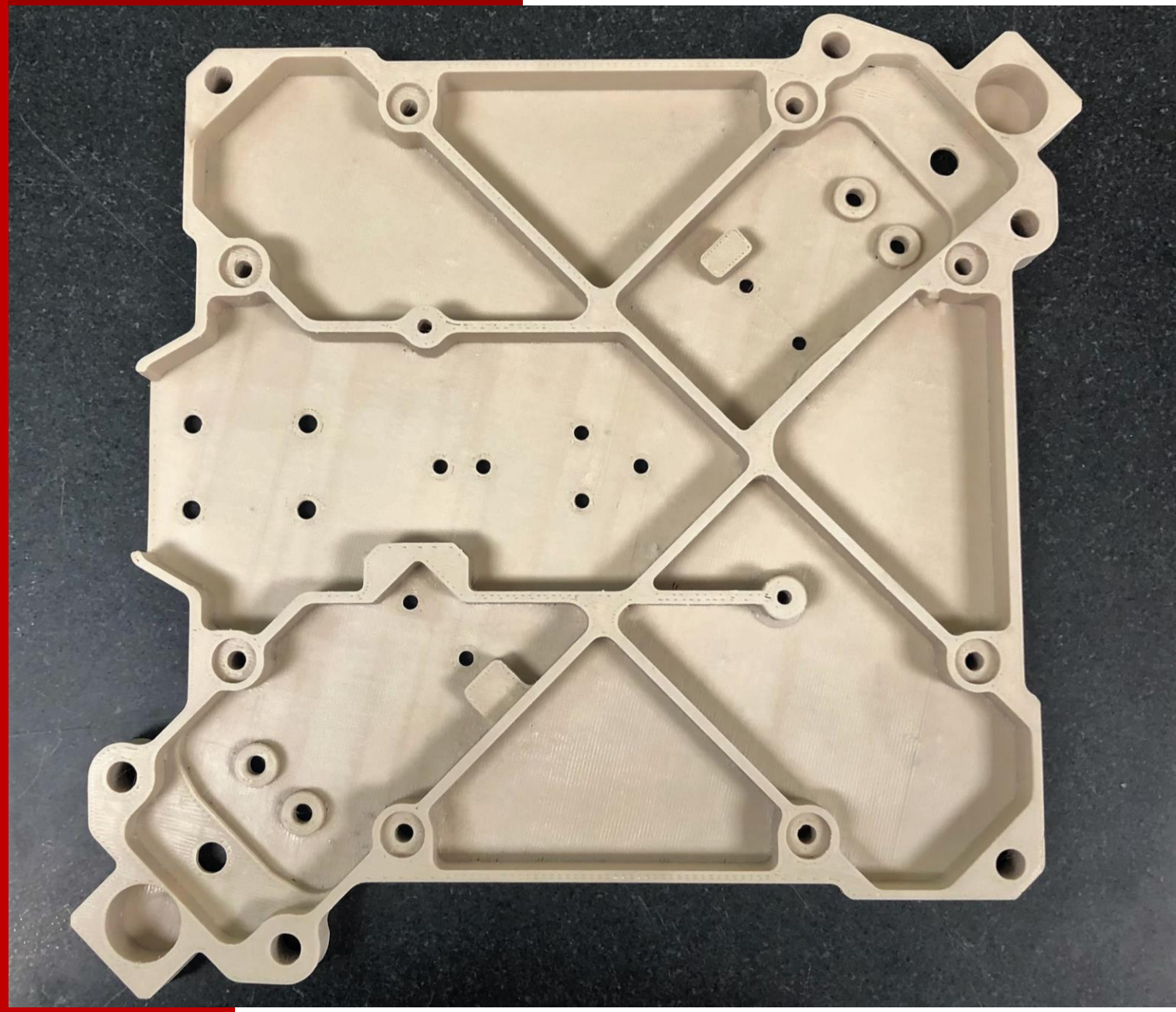




In collaboration with CONTROLLO QUALITÀ

SOME EXAMPLES ADDITIVE MANUFACTURING: POLYMERS

Technology: FDM
Material: Victrex AM™ 200 LMPAEK™
Description: Electronic frame
Business Sector: Space
Dimension: 295 x 298 x 20 mm

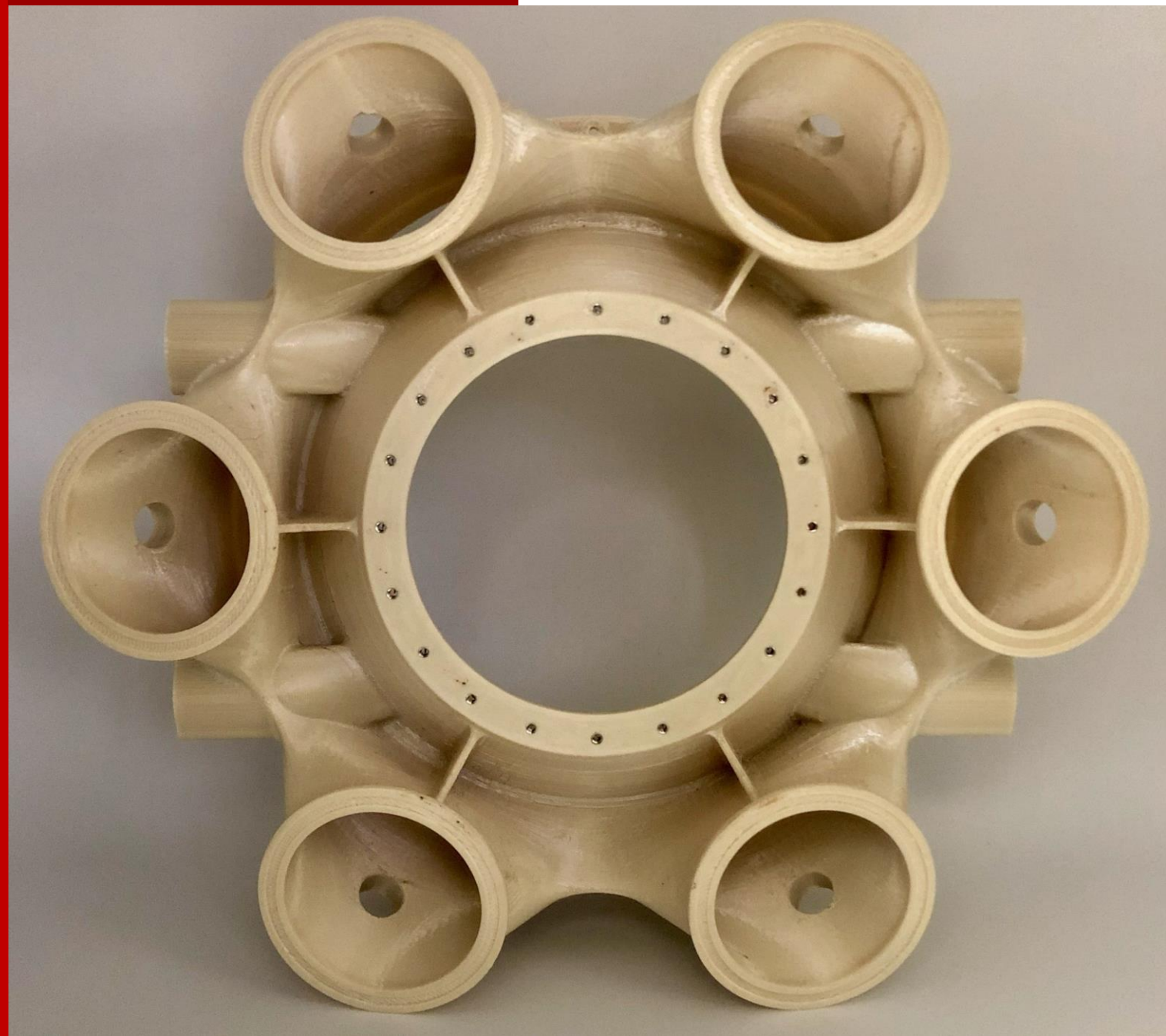


SOME EXAMPLES ADDITIVE MANUFACTURING: POLYMERS

Technology: FDM
Material: 3DAMSS PEKK-A-CF20
Description: Combuster A
Business Sector: Energy
Dimension: 250 x 370 x 110 mm

SOME EXAMPLES ADDITIVE MANUFACTURING: POLYMERS

Technology: FDM
Material: Sabic Ultem AM9085F
Description: Combuster B
Business Sector: Energy
Dimension: 290 x 295 x 80 mm

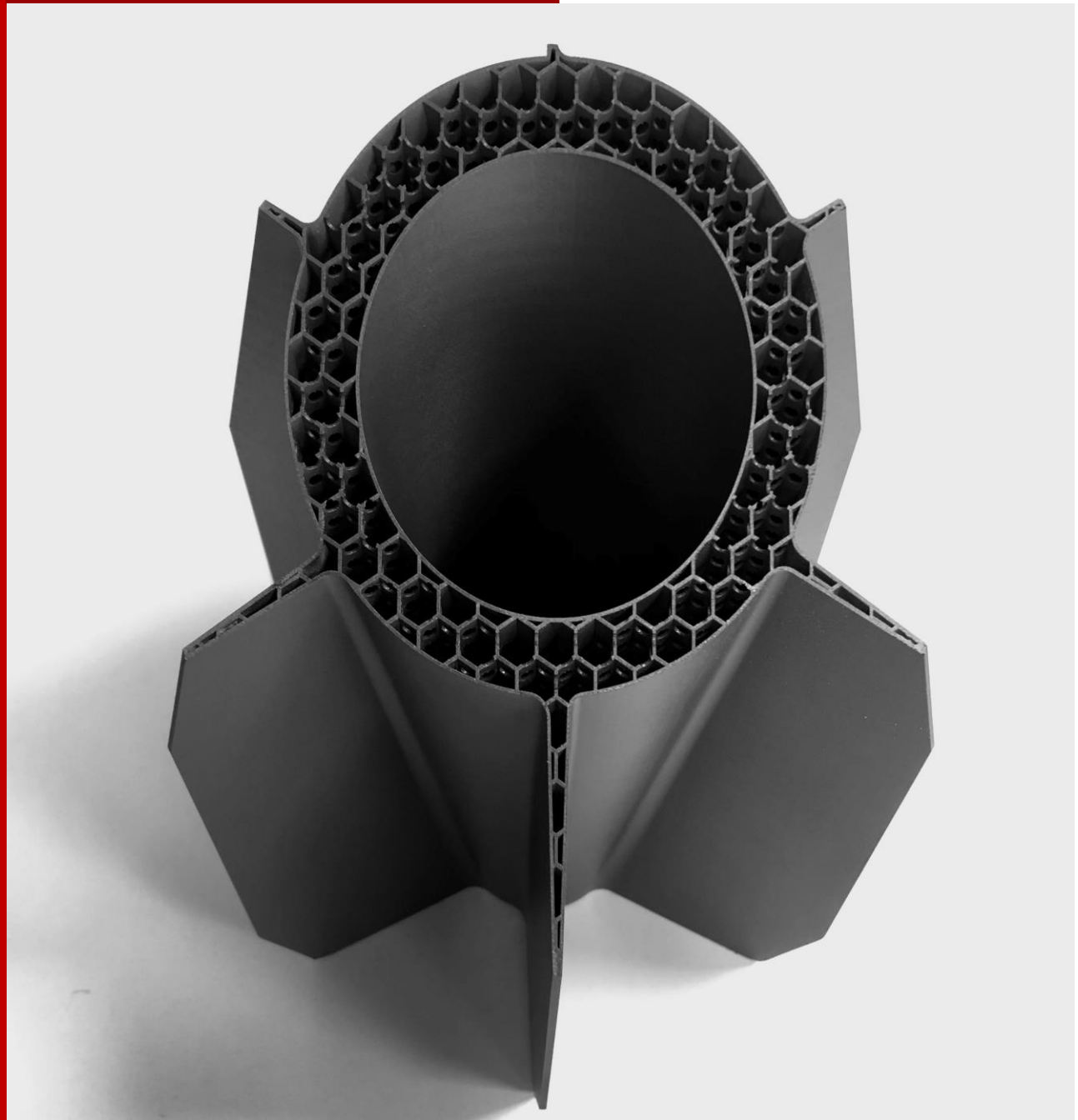


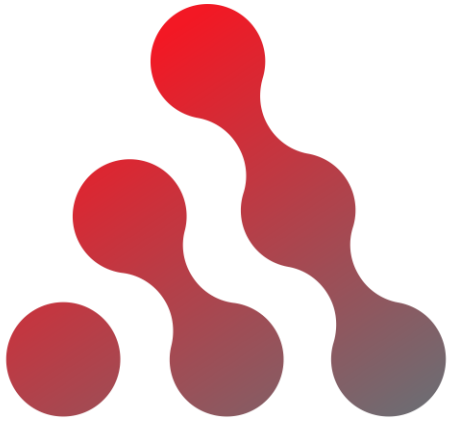
SOME EXAMPLES ADDITIVE MANUFACTURING: METALS

Technology: SLM
Material: AlSi10Mg
Description: Bracket
Business Sector: Space
Dimension: 230 x 230 x 275 mm

SOME EXAMPLES ADDITIVE MANUFACTURING: METALS

Technology: SLM
Material: AISI 316 L
Description: Rocket Tang
Business Sector: Defence
Dimension: 180 x 170 x 200 mm





ADD-ASTRA

LIMITLESS MATERIA INNOVATION

ADD-ASTRA SRL

Via Don Lorenzo Milani, 70

41122 Modena (MO) – Tel. 059 822877

C.F. e P.IVA 03948470368

www.add-astra.it