



# How additive manufacturing helps industries to stay competitive?

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# AN ALLIANCE BORN FROM AN INDUSTRIAL NEED. TWO COMPLEMENTARY TECHNOLOGIES



Metal AM since  
2005



**fives**  
200 years of  
Industrial Engineering

## AddUp

2016 Metal AM spin out

50/50 Joint Venture

Inherited expertise

Located in France

We design PBF and DED machines and  
we deepen our experience in our production facilities

Machine manufacture

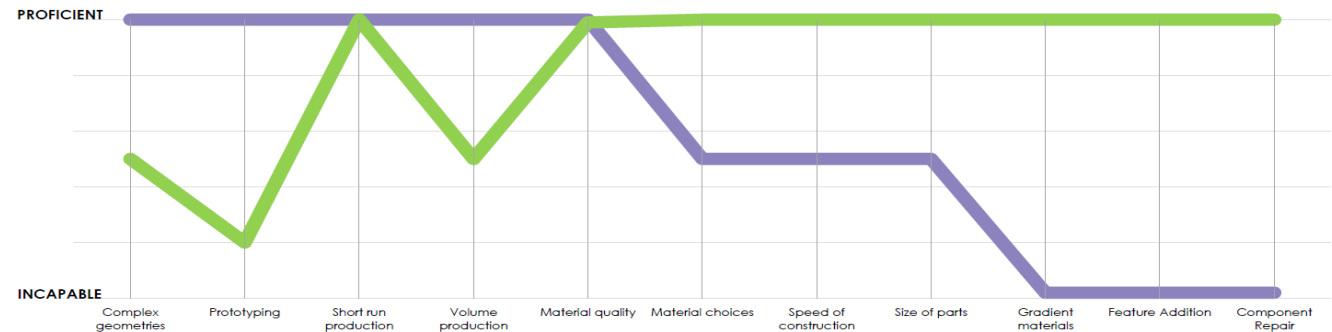


Parts manufacture

**FormUp® Range**  
PBF Technology



**Modulo Range**  
DED Technology



# How to generate value with Additive Manufacturing?



## Strategy

Could AM be a lead to reinvent your business ?



Co-creation

On-demand production

Customization



## Technology

Could AM be a solution for your technical and economic barriers ?



Delivery time reduction

Digitalization of stocks

Industrial simplification

Development time reduction

Cost reduction



## Product

Could AM be a solution to improve your product or a whole products system ?



Energy efficiency improvement

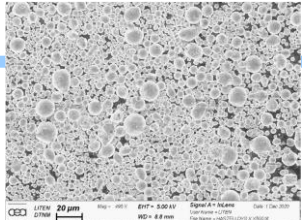
Function integration

Weight reduction

Visual features

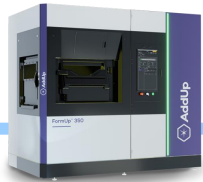
# Cycle of parts manufacturing

Material choice and characterization



SEM analysis

Process and equipment



Software



Part manufacturing with required properties



Abrasive flow machining



Chemical finishing



Powder removing



Stress relief

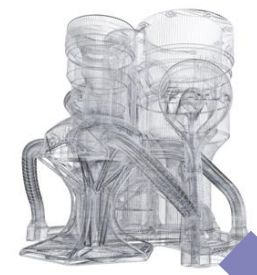
Post processing



Cutting

# NUMERIC CONTINUITY

Our software solution are fully inter-operable along the production step from design to final part



Inter-operability  
AddUp "NTwin"

- AddUp NTwin :**
- Trajectory setting
  - Production time
  - Production file generation
  - ...

Design  
AddUp Manager

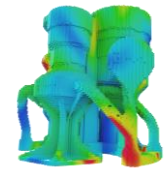
Final Part



Preparation

Simulation

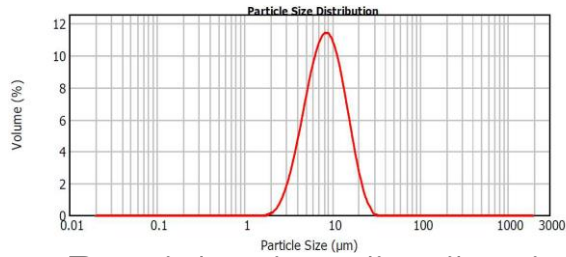
Production



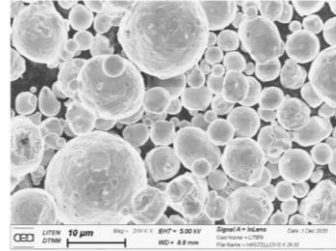
AddUp Manager

+ Monitoring Layering  
+ Monitoring Fusion

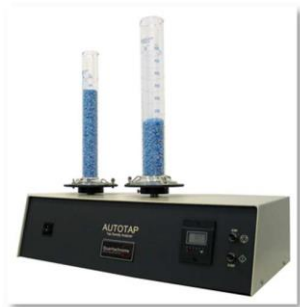
# Powder characterization and materials datasheets







Particle size distribution



SEM analysis



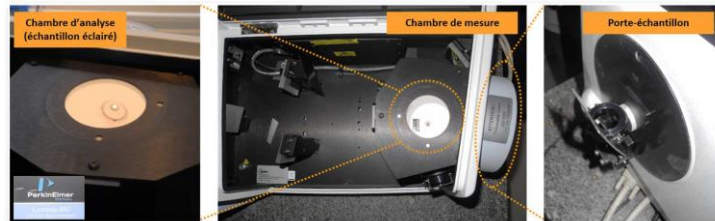
Tap and apparent density

Paramètre	Exemples			
Ratio d'aspect (traduit l'allongement)				
	= 1	= 0,18	= 1	= 0,76


Particle shape



He pycnometer



Optical specnrometer



### 316L

**SPECIFICATIONS**

EU X2CrNiMo17-12-2  
WN 1.4404  
USA UNS 31603

**MATERIAL DESCRIPTION**

Austenitic stainless steel with high ductility, often used for its good resistance to corrosion.

**COMPOSITION** weight %

Fe	Balance
Cr	17
Ni	12
Mn	2
P	0.035
C	0.03


**APPLICATIONS**

**MATERIAL CHARACTERISTICS**

Typical mechanical properties: The values are the minimum requirements but not guaranteed ones.

	Stress-relieved	Heat treated <sup>1</sup>
Ultimate Tensile Strength (UTS), MPa	775	800
Yield Strength (YS), MPa	540	400
Elongation at break (EB), %	30	40

**Physical properties:**




**Qualitative comparison according to processes:**

Coating, Forging, LBM, Laser Beam Melting

**TECHNICAL DATA**

Particle size:



### Inconel 718

**SPECIFICATIONS**

EU NiCr19Fe18NbMo  
USA N07718

**MATERIAL DESCRIPTION**

Nickel-based alloy, hardened 717, with good resistance to corrosion and having high mechanical properties up to 500°C.

**COMPOSITION** weight %

Ni	Balance
Cr	19
Fe	18.5
Nb	5
Mo	2
Ti	0.9
Al	0.5

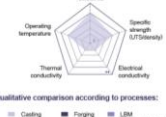
**APPLICATIONS**

**MATERIAL CHARACTERISTICS**

Typical mechanical properties: The values are the minimum requirements but not guaranteed ones.

	Stress-relieved	Heat treated <sup>1</sup>
Ultimate Tensile Strength (UTS), MPa	1380	1400
Yield Strength (YS), MPa	1200	1300
Elongation at break (EB), %	16	16

**Physical properties:**



**Qualitative comparison according to processes:**

Coating, Forging, LBM, Laser Beam Melting

**TECHNICAL DATA**

Particle size:



### Maraging 300

**DÉNOMINATIONS**

EU X3NiCoMo18-9-5  
WN 1.2709  
ENX300

**PROPRIÉTÉS REMARQUABLES**

- Acier prétraité d'aciers à haute teneur en carbone, caractérisés mécaniquement et chimiquement par une teneur élevée en Nickel et un équipement utilisé pour des pièces de structure ou des outillages.

**COMPOSITION**

Fe	Balance
Ni	18
Co	9
Mn	5
Ti	0.05
C	0.02

**APPLICATIONS**

**FICHE MATERIEL**

Propriétés mécaniques typiques

	Dimension	Unité
Résistance à la traction - Rm (peu)	3500	3500
Résistance à la traction - Rp0.2 (peu)	2400	2400
Allongement à 0.2%	10	6

**Caractéristiques physiques**

Résistance à la corrosion



**Comparaison qualitative selon procédés**

Coating, Forging, LBM, Laser Beam Melting

**Données techniques**

NE PAS MANIPULER  
Dépendre d'un filtre sous atmosphère contrôlée.  
NE PAS MANIPULER  
AddUp est enregistré dans le chat de nos fournisseurs de produits.



### TA6V

**DÉNOMINATIONS**

EU Ti-6Al-4V  
USA UNSR56400

**PROPRIÉTÉS REMARQUABLES**

- Alliage d'aluminium présentant une teneur élevée en Vanadium et une bonne résistance à la corrosion, avec également de bonnes propriétés mécaniques et des caractéristiques thermiques et électriques élevées.

**COMPOSITION**

Al	6
V	4
Fe	0.05

**APPLICATIONS**

**FICHE MATERIEL**


Propriétés mécaniques typiques

	Dimension	Unité
Résistance à la traction - Rm (peu)	980	980
Résistance à la traction - Rp0.2 (peu)	830	830
Allongement à 0.2%	10	10

**Caractéristiques physiques**

Résistance à la corrosion





### AlSi7Mg0.6

**DÉNOMINATIONS**

EU EN-AC-42200  
FR A27006  
USA UNS10970

**PROPRIÉTÉS REMARQUABLES**

- Alliage d'aluminium présentant une teneur élevée en Silicium et une bonne résistance à la corrosion, avec également de bonnes propriétés mécaniques et des caractéristiques thermiques et électriques élevées.

**COMPOSITION**

Al	Balance
Si	7
Mg	0.6

**APPLICATIONS**

**FICHE MATERIEL**

Propriétés mécaniques typiques

	Dimension	Unité
Résistance à la traction - Rm (peu)	420	420
Résistance à la traction - Rp0.2 (peu)	350	350
Allongement à 0.2%	14	14

**Caractéristiques physiques**

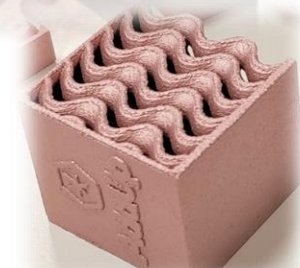
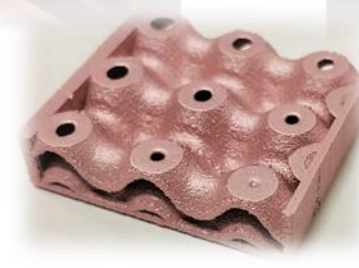
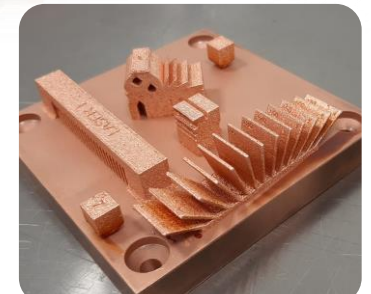
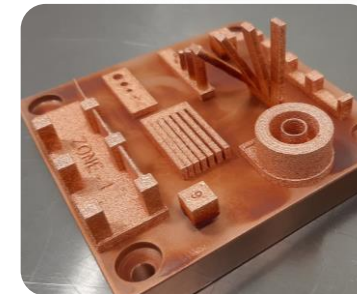
Résistance à la corrosion



# Development of new materials : pure Copper on FormUp 350

- Commercially Pure Copper on a FormUp 350 equipped with 1 KW fiber laser
- Machine build Volume = 350 x 350 x350 mm
- Porosity Level < 0,4%
- TRL : 4

	AddUp
Density	> 99,6 %
Electrical conductivity (w/o heat treatment)	> 94 % IACS
Tensile strenght (Rm) (w/o heat treatment)	225 MPa
Yield strenght (Rp 0,2) (w/o heat treatment)	145 Mpa
Elongation at break (A%)	50 %



Results achieved in the frame of the project **AMBITION** in partnership with



RICHEMONT



And with the financial support of



# ORNAMENT - DS7 CROSSBACK Louvre –Limited edition.



Manufacturing of 5 000 parts from 316L



- Manufacturing of 200 parts from 316L by a single built
- Full production time of a building plate: 21 hours
- Production time of a single part : less than 6 minutes



# Collaboration between KIF Parechoc and AddUp



« Les sociétés partageront leurs savoir-faire dans les applications microtechniques et horlogères pour développer ensemble des designs de pièces innovants et des réalisations de fonctions mécaniques inédites. De la précision du design et de l'impression des pièces, à la minutie des finitions et du contrôle, ce partenariat saura répondre aux plus hautes exigences de nos clients. »



Thank you for your attention

