



Additive is competitive

Materials & Applications Handbook for **Powder Bed Fusion**

Contents

- 01 Next Level. Next to you.
- **02** Straight to the heart of Prima Additive
- **03** Wide range of training and consultation services
- 04 The variety of Prima Additive materials for Powder Bed Technology

06	Aluminium
08	Steel
12	Titanium
14	Nickel
18	Cobalt-chromium
20	Copper

ADDITIVE MATERIALS

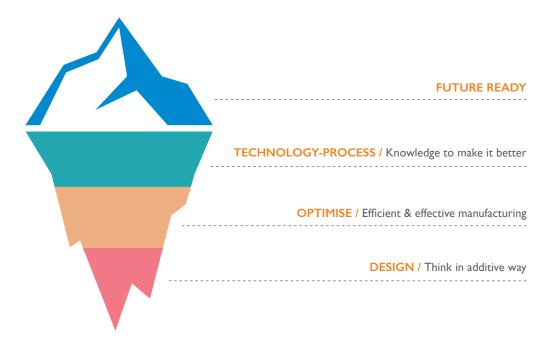
24 Prima Additive at your disposal: application study

Next level. Next to you.

The rapidly evolving field of Additive Manufacturing has still only touched the tip of the iceberg in terms of maturity, with significant progress still to be made in all areas, not limited to development of design, software, processes, materials, equipment and services.

In line with the Prima Industrie philosophy, Prima Additive is next to you as your partner offering a unique, full turnkey solution through this journey. Supporting you in all areas of additive powder bed fusion and direct energy deposition from design and application support through to provision of equipment with our long established global service network.

Our team of experts will always be available to listen, collaborate, assist and advise you.



What can be found in this brochure

A comprehensive selection of **Prima Additive Materials for Powder Bed Technology** for 3D printing components.

A straight path to the heart of Prima Additive, presenting applications and manufacturing capacity.

An **introduction** to our philosophy to discover our way of proceeding, planning and developing functional components.

A specialised and experienced **customer service**, ranging from application support to the design phase, as well as training courses and assistance throughout the national territory and beyond.

Straight to the heart of Prima Additive

With Prima Additive you make your business future-ready in few steps. Always next to the customer, our engineers will guide you through a concrete approach to improve your production process.

We provide a **support service dedicated to the customer** at every stage of system supply: from choosing the machines, based on the industrial sector, up to reaching the maximum manufacturing capacity.



Application support

Helping you identify how to rapidly deploy the Additive Manufacturing process to your business in the most competitive way possible



Design support

Supporting you in design for additive, we can design and build your prototype in our application centre



Field service

Both preventive maintenance and high-quality corrective maintenance to guarantee fast recovery when there is a problem.With more than 13,000 machines installed in more than 80 countries, we are able to give you the required assistance in your language



Remote care

Remote diagnostic and assistance. Skilled service engineers are available to operate remotely with your machines in real time



Training

Training programs and updates for using our machines and software to their best, maximising manufacturing capacity and quality

Wide range of training and consultation services

Our group of specialized engineers is always next to you. You have a unique opportunity to see first hand the capabilities of the technology and we can together identify how to rapidly deploy it in your business in the most competitive manner.

By choosing Prima Additive you take one more step towards the new frontier of manufacturing. We can offer training programs and updates for using our machines and software to their best, maximising manufacturing capacity and quality.

Pre-sales

I.

2

- Demo activities in our Application Center
- Overview of the additive process through a real typical layout
- · Application study of customer real case with possibility to prototype a real parts

Installation and operation

OPERATOR TRAINING

- Basic training on main functions of machine (control software operation, set up, safety)
- Training on peripheral equipment (dry oven, sieve etc)
- · Practice on pre-selected parts to check main issues, alarms and operation details

APPLICATION TRAINING

- Use of Materialise Magics and BPP (Build post processor) software
- How to prepare a job file and set parameters
- How to support
- · Set up machine and print specific parts with errors
- Rules of thumb for orientation and design for printing according to the used material

After-sales

- Application support
- Consultation
- Worldwide Service
- 3

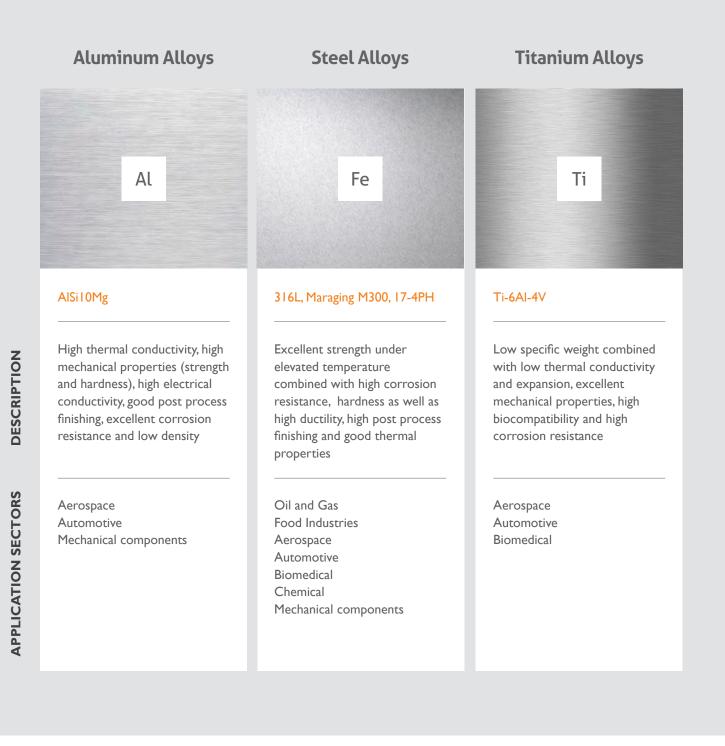
ADVANCED TRAINING

- Training on how manage process parameters on BPP (Build post processor) software
- Process parameters adjustment and process optimization
- Powder and part characterization

The variety of Prima Additive materials for Powder Bed Technology

Discover the list of materials available for your selective metal additive manufacturing. **Prima Additive offers a comprehensive selection of metal powders** ranging from aluminum through to nickel, steel, titanium as well as copper chrome alloys. In this way materials, machines and manufacturing parameters are harmonized for excellent results.

Prima Additive are constantly striving to improve materials technology, machines and processes to support you to qualify your powder. We develop the correct process parameters and set an optimal configuration for your machine to ensure quality and repeatability.



04

Do you need to realize parts in a different material?

We are open to investigate and produce new materials suitable for additive in order to accommodate your specific needs. We will evaluate your business case, developing with you the best material for your application.

Nickel Alloys

Cobalt-chromium Alloys

Copper Alloys



In625, In718

High yield, fatigue and creep strength with excellent antioxidation and anti-corrosion behavior in aggressive environments, high corrosion resistance at high temperatures high strength and good ductility

Aerospace Automotive Biomedical Chemical Energy Oil and Gas Mechanical component Marine

CoCr

Biocompatibility, exceptional strength and durability, and resistance to wear and corrosion

Medical Dental Energy Oil and Gas Automotive Design objects Jewelry

CuSn10, Cu

High resistance against corrosion combined with mechanical properties and both thermal and electrical conductivity

Electronics Aerospace Jewelry

Aluminum Alloys

AlSi10Mg

MATERIAL PROPERTIES	APPLICATIONS
Low density (high ratio mass/strength)	Automotive
High thermal conductivity	Electronics
Good post process finishing	Cooling device, heat exchangers
High electrical conductivity	Aerospace and defense
High specific strength	

AI	Si	Fe	Cu	Mn	Mg	Ni	Zn	Pb	Sn	Ti
Balance	9.0 - 11	≤ 0.55	≤ 0.05	≤ 0.45	0.2-0.45	≤ 0.05	≤ 0.10	≤ 0.05	≤ 0.05	≤ 0.15

MECHANICAL DATA	UNIT	AS-BUILT	AS-BUILT
Particles Size Distribution	μm	20-63	20-63
Density	g/cm³	2.65	2.65
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4	0.3-0.4
Layer thickness	μm	30	60
Roughness	R _a (µm)	As-built: 6-10 After shot blasting: 7-10	As-built: 20
Tensile strength	R ^m (MPa)	460±20 (XY) / 460±20 (Z)	420±7 (XY) / 399±8 (Z)
Yield strength	R ^{p0,2} (MPa)	270±20 (XY) / 270±20 (Z)	276±1 (XY) / 228±5 (Z)
Young modulus	E (GPa)	75±10 (XY) / 70±10 (Z)	87±8 (XY) / 82±6 (Z)
Elongation at break	A (%)	8±2	10±1.5 (XY) / 4.5±0.5 (Z)
Hardness	HRB	55±5	70±1

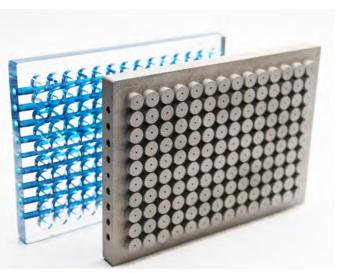
Aluminum Applications

Small lots - Complex parts	
SECTOR	AEROSPACE
INTENDED USE	ENGINETANK
TECHNICAL DETAILS	Build time*: 28 hours for 1 unit Up to 36 hours for 2 units Layer thickness: 30 μm Time reduction of 40% with 60 μm Material: AlSi10Mg Part Dimension (X-Y-Z): 107 x 153 x 155 mm

Small lots - Internal Channels				
SECTOR ELECTRONICS				
INTENDED USE	E COOLING/HEATING DEVICE			
TECHNICAL DETAILS	Build time*: 20 hours 1 part Layer thickness: 30 μm Material: AlSi10Mg Part Dimension (X-Y-Z): 142 x 102 x 15 mm Internal Channels Diameters: 0.8-1.5 mm			



Engine Tank (Small lots - Complex parts)



Cooling/Heating device (Small lots - Internal Channels)

Steel Alloys

AISI316L

MATERIAL PROPERTIES	APPLICATIONS
High corrosion resistance	Oil and Gas
High hardness	Food industries
High ductility	Automotive
High post process finishing	Aerospace
High strength under elevated temperature	Moulds
	Surgical tools

Fe	Cr	Ni	Мо	Mn	Si	Р	S	С	N	0
Balance	16-18	10-14	2-3	2	I	0.045	0.03	0.03	0.1	0.1

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm³	7.9
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.1
Layer thickness	μm	30
Roughness	R _a (µm)	As-built: 11±5 After shot blasting: 5±2
Tensile strength	R ^m (MPa)	720±40 (XY) / 690±30 (Z)
Yield strength	R ^{p0,2} (MPa)	670±30 (XY) / 630±50 (Z)
Young modulus	E (GPa)	185 (XY) / 180 (Z)
Elongation at break	A (%)	30±5
Hardness	HRB	87±3

Maraging M300

MATERIAL PROPERTIES	APPLICATIONS
High strength	Moulds
High hardness	High Structural Strenght Components
High fatigue strength	Tools
High post process finishing	

Fe	Ni	Co	Мо	Ti	AI	Cr,Cu	С	Mn, Si	Р	S
Balance	17-19	8.5-9.5	4.5-5-2	0.6-0.8	0.05-0.15	≤ 0.05	≤ 0.03	≤ 0.1	≤ 0.01	≤ 0.01

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm³	8.1
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.2
Layer thickness	μm	40
Roughness	R _a (µm)	As-built: 15 After shot blasting: 4-6
Tensile strength	R ^m (MPa)	1100±100 (XY) / 1100±100 (Z)
Yield strength	R ^{p0,2} (MPa)	1050±50 (XY) / 1000±50 (Z)
Young modulus	E (GPa)	185 (XY) / 180 (Z)
Elongation at break	A (%)	12±3
Hardness	HRC	35±2

Steel Alloys

17-4PH

MATERIAL PROPERTIES	APPLICATIONS
Precipitation-hardening steel	Chemical
High tensile strenght	Medical
Moderate corrosion resistance	Aerospace

Fe	Cr	Ni	Cu	Mn	Si	Nb + Ta	С	Ν	0	Р	S
Balance	15-17.5	3-5	3-5	I	Ι	0.15-045	0.07	0.1	0.1	0.04	0.03

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm³	7.8
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4
Layer thickness	μm	40
Roughness	R _a (µm)	As-built: 11-13 After shot blasting: 4-6
Tensile strength	R ^m (MPa)	960±30 (XY) / 860±30 (Z)
Yield strength	R ^{p0,2} (MPa)	910±30 (XY) / 830±30 (Z)
Young modulus	E (GPa)	150
Elongation at break	A (%)	21±3
Hardness	HRC	35±3

Steel Applications

Complex parts - Rapid Prototyping		
SECTOR	AUTOMOTIVE	
INTENDED USE	exhaust manifolds	
TECHNICAL DETAILS	Build time*: 60 hours for 3 units Up to 120 hours for 9 units	
	Layer thickness: 30 µm	
	Material: AISI316L	
	Part Dimension (X-Y-Z): 51 x 110 x 226 mm	



Custom Molo	ds	
SECTOR	MOLDS	
INTENDED USE	CONFORMAL COOLING MOLD	2
	Build time*: 34 hours for 1 unit	
TECHNICAL DETAILS	Layer thickness: 40 µm	
	Material: Maraging M300	
	Part Dimension (X-Y-Z): 50 x 50 x 60 mm	

Titanium Alloys

Ti6Al4V

MATERIAL PROPERTIES	APPLICATIONS
High Biocompatibility	Medical
Excellent specific strength	Motorsport
High Corrosion resistance	Aerospace
Low thermal conductivity and expansion	High value Sport components

Ti	AI	V	С	ο	N	Fe	н	Y	Others
Balance	5.5-6.5	3.5-4.5	0.08	0.13	0.03	0.25	0.015	0.005	0.4

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	20-63
Density	g/cm³	4.4
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4
Layer thickness	μm	30
Roughness	R _a (µm)	As-built: 9-12 After shot blasting: 2.8-3.6
Tensile strength	R ^m (MPa)	1230±50 (XY) / 1190±50 (Z)
Yield strength	R ^{p0,2} (MPa)	1080±50 (XY) / 1070±80 (Z)
Young modulus	E (GPa)	110
Elongation at break	A (%)	12±2
Hardness	HRC	36±4

Titanium Applications

Medical	
SECTOR	MEDICAL
INTENDED USE	IMPLANTS
TECHNICAL DETAILS	Build time*: 2 hours for 1 unit Layer thickness: 30 μm Material: Ti6Al4V Part Dimension (X-Y-Z): 19 x 54 x 21 mm Tips Diameters: from 2.00 to 0.2 mm

Structural Components - Topology Optimization		
SECTOR	STRUCTURAL COMPONENT	
INTENDED USE	BRACKET	
TECHNICAL DETAILS	Build time*: 5 hours for 1 unit Up to 3.5 hours for multiple units Layer thickness: 30 μm Material: Ti6Al4V Part Dimension (X-Y-Z): 80 × 32 × 47 mm	



Implants (Medical)

Bracket (Structural Components - Topology Optimization)

Nickel Alloys

In625

MATERIAL PROPERTIES	APPLICATIONS
High corrosion resistance at high temperatures	Oil and Gas
High creep resistance	Marine
Good Ductility	Aerospace
High strenght	Automotive
	Chemical
	Energy

Ni	Cr	Mo	Nb	Fe	Co	Si	Mn	Ti	AI	С	S	Р
Balance	20-23	08-10	3.15-4.15	5	I	0.5	0.5	0.4	0.4	0.1	0.015	0.015

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm³	8.4
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.2
Layer thickness	μm	40
Roughness	R _a (µm)	As-built: 10-13 After shot blasting: 2.8-4
Tensile strength	R ^m (MPa)	1080±30 (XY) / 970±30 (Z)
Yield strength	R ^{p0,2} (MPa)	880±20 (XY) / 790±30 (Z)
Young modulus	E (GPa)	170±20 (XY) / 140±20 (Z)
Elongation at break	A (%)	22±2
Hardness	HRC	32±3

Nickel Applications

Automotive - Rapid Prototyping					
SECTOR	AUTOMOTIVE				
INTENDED USE	BRAKE CALIPER				
TECHNICAL DETAILS	Build time*: 5 hours for 1 unit Up to 3.5 hours for multiple units Layer thickness: 40 μm				
	Material: In625				
	Part Dimension (X-Y-Z): 8 x 155 x 60 mm				



Nickel Alloys

In718

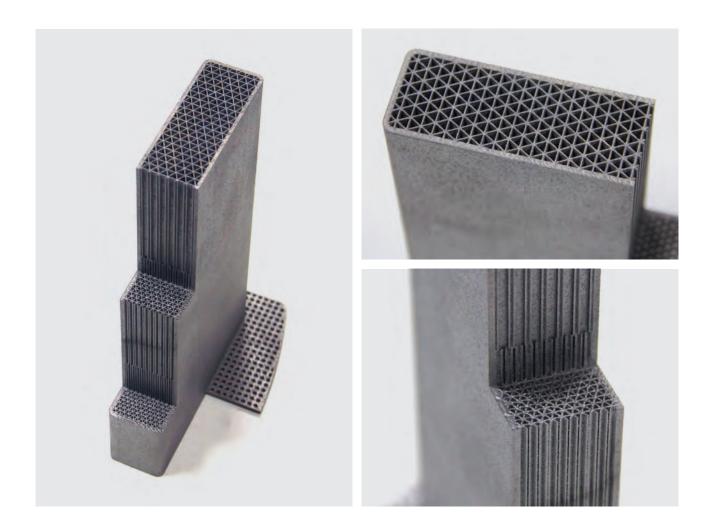
MATERIAL PROPERTIES	APPLICATIONS
High corrosion resistance at high temperatures	Oil and Gas
High creep resistance	Turbine Blades
Good Ductility	Aerospace
High strenght up to 700°C	Heat Exchangers
	Energy

Ni	Cr	Fe	Ta+Nb	Mo	Ti	AI	Cu	С	Si	Mn	В	Co	Р	S
50-55	17-21	Balance	4.75-5.5	2.8-3.3	0.65-1.15	0.2-0.8	0.3	0.08	0.35	0.35	0.006	T	0.015	0.015

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm ³	8.1
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.2
Layer thickness	μm	40
Roughness	R _a (µm)	As-built: 10-13 After shot blasting: 2.8-4
Tensile strength	R ^m (MPa)	1060±30 (XY) / 990±30 (Z)
Yield strength	R ^{p0,2} (MPa)	750±50 (XY) / 720±50 (Z)
Young modulus	E (GPa)	160±20 (XY) / 130±20 (Z)
Elongation at break	A (%)	25±3
Hardness	HRC	27

Nickel Applications

Small lots - Complex parts					
SECTOR	AUTOMOTIVE				
INTENDED USE	HEAT EXCHANGER				
TECHNICAL DETAILS	Build time*: 88 hours for 4 unit Up to 16 hours/each for multiple units Layer thickness: 40 μm Material: In718 Part Dimension (X-Y-Z): 95 x 25 x 154 mm Internal Wall thickness: 0.12 mm				



Cobalt-Chromium Alloys

CoCr

MATERIAL PROPERTIES	APPLICATIONS
High Biocompatibility	Medical and dental implants
Excellent strength and durability	Oil & Gas
High Corrosion and Wear resistance	Automotive
	Jewelry and design objects

Co	Cr	Mo	Mn	Si	Fe	Ni	с	AI	В	Ν	Р	S	w	Ti	ο
Balance															

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-45
Density	g/cm³	8.7
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4
Layer thickness	μm	30
Roughness	R _a (µm)	As-built: 10 After shot blasting: 4-6
Tensile strength	R ^m (MPa)	1200±30 (XY) / 1050±20 (Z)
Yield strength	R ^{p0,2} (MPa)	900±40 (XY) / 700±50 (Z)
Young modulus	E (GPa)	200
Elongation at break	A (%)	17±4
Hardness	HRC	40±2

Cobalt-chromium Applications

Dental prostheses				
SECTOR	DENTAL			
INTENDED USE	IMPLANTS			
TECHNICAL DETAILS	Build time*: 5h30 (3h20 with two lasers) for 180 units Layer thickness: 30 μm Material: CoCr			

Dental prostheses	
SECTOR	DENTAL
INTENDED USE	SKELETON
TECHNICAL DETAILS	Build time*: 8h30 (5h30 with two lasers) for 15 units Layer thickness: 30 μm Material: CoCr



Dental implants

Dental skeleton

Copper Alloys

CuSn10

MATERIAL PROPERTIES	APPLICATIONS
Good corrosion resistance	Electronics
Good Thermal conductivity	Aerospace
Good Electrical conductivity	Heat Exchanger
Good mechanical property	Jewelry

Cu	Sn	AI	Fe	Mn	Ni	Р	Pb	S	Sb	Si	Zn
Balance	10	0.01	0.2	0.1	2	0.2	I	0.05	0.2	0.02	0.5

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	10-35
Density	g/cm³	8.7
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4
Layer thickness	μm	30
Roughness	R _a (µm)	As-built: 10 After shot blasting: 4-6
Tensile strength	R ^m (MPa)	490±30 (XY) / 380±20 (Z)
Yield strength	R ^{p0,2} (MPa)	400±40 (XY) / 340±30 (Z)
Young modulus	E (GPa)	115
Elongation at break	A (%)	17±4
Hardness	HRB	74±4

Copper Applications

Small lots - Complex parts	
SECTOR	AUTOMOTIVE
INTENDED USE	INDUCTOR
TECHNICAL DETAILS	Build time*: 150 hours for 2 unit Layer thickness: 30 μm Material: CuSn10 Part Dimension (X-Y-Z): 210 x 104 x 82 mm Internal channels of 6 mm



Copper Alloys

Cu

MATERIAL PROPERTIES	APPLICATIONS
Good corrosion resistance	Electronics
Good Thermal conductivity	Aerospace
Good Electrical conductivity	Heat Exchanger
Good mechanical property	Jewelry

Cu	ο	Р
99.0	0.15	0.5

MECHANICAL DATA	UNIT	AS-BUILT
Particles Size Distribution	μm	20-53
Density	g/cm³	8.9 (>99.0% as built)
Part Accuracy	mm	≤0.1 big dimension ≤0.05 small dimension
Thinnest wall	mm	0.3-0.4
Layer thickness	μm	30
Roughness	R _a (µm)	As-built: 5 (vertical) / 7 (inclined) After shot blasting: 3-4
Tensile strength	R ^m (MPa)	185±30 (XY) / 170±20 (Z)
Yield strength	R ^{p0,2} (MPa)	165±30 (XY) / 150±20 (Z)
Young modulus	E (GPa)	65
Elongation at break	A (%)	5±2
Hardness	HRB	N/A

Copper Applications

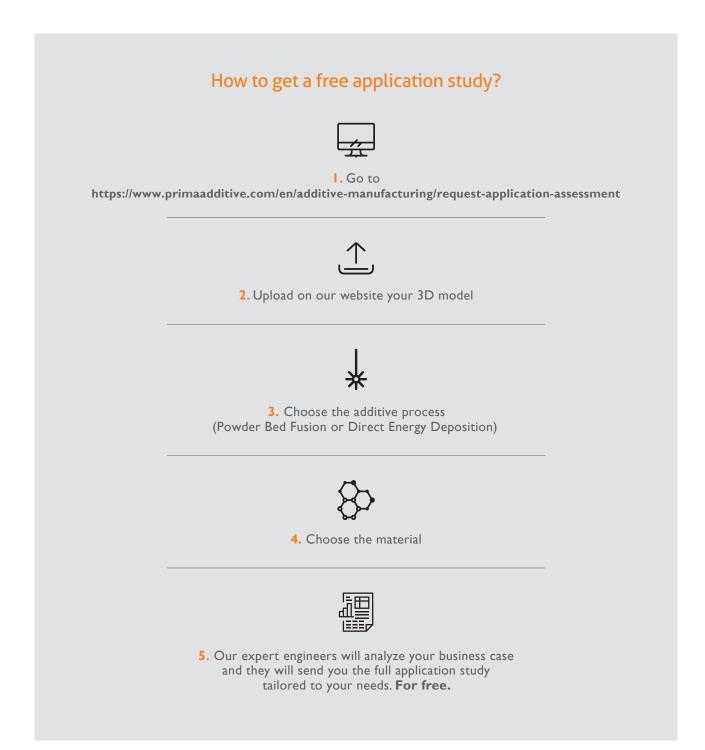
Small lots - Complex parts		
SECTOR	ELECTRONICS	
INTENDED USE	INDUCTOR	
TECHNICAL DETAILS	Build time*: 46 hours Layer thickness: 30 μm Material: Cu Part Dimension (X-Y-Z): 61 x 43 x 40 mm Internal channels of 4 mm	



Prima Additive at your disposal: application study

Additive is competitive. This is our philosophy, but also our commitment to advancing the industry by reducing the barriers to entry in Additive Manufacturing. We guide and help customers to develop their right additive application. We are open to investigate and produce new materials suitable for additive manufacturing in order to accommodate your specific needs.

Do you want to know if additive manufacturing is the best solution for your business? Contact Prima Additive, we can help you establish materials, machines and production process that most benefits your business.



Contacts

STEP INTO THE NEW FRONTIER OF MANUFACTURING WITH PRIMA ADDITIVE

Contact us for more details about the Prima Additive product range and discover how your business could be future-ready as early as today.

info@primaadditive.com

www.primaadditive.com



Concept and design Ars Media Icons made by Freepik from www.flaticon.com are licensed under CC BY 3.0



primaadditive.com