THE EXPERTS IN METAL ADDITIVE MANUFACTURING





Federal Supply Service FSC Group 36, Part I FSC Class 3415, Current Solicitation Refresh: 34

Contract Number: GS-03F-098CA SIN: 51.400 3D Printing Solutions

AUTHORIZED FEDERAL SUPPLY SCHEDULE PRICE LIST

GPI MANUFACTURING, INC.

DBA GPI Prototype & Manufacturing Services 940 North Shore Drive Lake Bluff, IL 60044-2202 Phone: 847-615-8900 FAX: 847-615-8920 www.gpiprototype.com Business Size: Small

Contract Administrator: Kate Kummerer Email: katek@gpiprototype.com Contract period: August 31, 2015 – August 30, 2020

Online access to contract ordering information, terms and conditions, up-to-date pricing, and the option to create an electronic delivery order are available through GSA Advantage! TM, a menu-driven database system at http:// www. GSAAdvantage.gov.

For more information on ordering from Federal Supply Schedules click on the FSS Schedules at: http://www.fss.gsa.gov.



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 - (847) 615-8900



ABOUT US

GPI Prototype and Manufacturing Services Inc. has been providing Direct Metal Laser Melting (DMLM) services since 2009. As one of the first Metal Additive Manufacturing (3D Printing) service providers in the country, GPI Prototype & Manufacturing Services Inc. has the expertise to take our clients from early prototyping all the way to finished, small run manufacturing.

With 25 employees dedicated to DMLM, GPI produces prototypes and end-use parts with complex geometries not possible with traditional machining in a variety of metals including aluminum, stainless steel, titanium, Inconel and cobalt chrome. Our engineers and consultants work with clients ranging from Fortune 500 companies in the medical, aerospace and defense industries to students in university laboratories. Parts built by GPI can be found on the first student (SEDS) designed rocket powered by a 100% additively manufactured engine. Dedicated to maintaining cutting edge technology, GPI helps our clients rethink and revolutionize the way their parts are designed and manufactured. To further ensure the highest quality parts, GPI is pleased to be ISO 9001:2008, ISO 13485:2003, and AS9100:2009 Rev-C certified as well as ITAR registered.

REGISTERED



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CAPABILITIES

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GPI is pleased to offer Direct Metal Laser Melting services on site using EOS and 3DSystems machines in the following manufacturer's supplied metal powders:

Material	Characteristics	Advantages/Applications
Stainless Steel (PH1)	 15-5 Mechanical Properties 20 or 40 micron layers 30-35 HRC Built Post Hardened to 40 HRC 	 Prototype/Production Parts High Toughness, Ductility, Strength
Stainless Steel (GP1)	 17-4 Mechanical Properties 20 or 40 micron layers 250 - 400 HV Hardness Post Hardenable 	 Prototype/Production Parts Good Mechanical Properties
Cobalt Chrome	 High Carbon CoCr Alloy 20 or 40 micron layers 35 – 45 HRC Built 	 Turbines and Engine Parts High Temperature Resistance
Maraging Steel (MS1) - Tooling Steel	 Maraging (Tooling) Steel 20 or 40 micron layers 33-37 HRC Built Post Hardened to 50 - 54 HRC 	 Prototype/Production Parts Good Mechanical Properties
Titanium Alloy Ti-64	 Pre-Alloyed Ti6AIV4 30 Micron Layers 41 – 44 HRC Built 	 Aerospace Parts High Strength and Light Weight
Aluminum AlSi10Mg	 Good Strength and Hardness Low Weight Good Thermal Properties 	 Low Weight Applications Automotive and Racing Applications Thermal Parts
Nickel Alloy IN718 - Inconel	 Nickel Based Heat Resistant Alloy 20 Micron Layers 30 HRC Built Post Hardened 47 HRC 	 Turbine Engines Rocket and Aerospace Applications Chemical Industry Parts Heat and Corrosion Resistant
Stainless Steel 316 L (Low Carbon 0.030% Max C Content)	 20 Micron Layers 85 HRB Built Non Heat-Treatable 	 Good Pitting and Crevice Corrosion Resistance Industrial / Aerospace / Turbine Parts Watches, Jewelry

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Direct Metal Laser Melting



GPI Prototype is a service provider of Direct Metal Laser Melting (DMLM), the latest technology for prototyping and additive manufacturing of metal parts. As one of the first DMLM service providers in the country, GPI produces metal parts for applications ranging from prototypes to production. DMLM technology is ideal for a variety of applications including the creation of conformal cooling channels for injection molding tooling. DMLM is also known by the acronym DMLS, although the process results in full melting of the metal powder, so we have begun to use the more appropriate DMLM acronym.

Utilizing the DMLM process, metal parts of the most complex geometries are built layer-by-layer (down to 20 microns) directly from 3D CAD data. Parts built using DMLM have excellent mechanical properties equivalent to wrought materials, high detail resolution, and exceptional surface quality. The metal powder is melted entirely to create a fully dense, fine, homogenous structure. Unique geometric freedom of design enables DMLM to form cavities and undercuts, which with conventional machining methods, can only be produced with great difficulty, if at all.

Additionally, when a part needs to be tested and re-designed over and over, the lead time for receiving a traditionally tooled part can create a large bottleneck in the final production process. DMLM produces parts that are extremely high quality and can be built in a matter of hours or days rather than weeks. The ability to generate functional metal prototypes in short order radically impacts design processes, accelerating design cycles and time to market.

Depending on size and geometries, the turnaround time for a part can be as little as a few hours. Furthermore, these parts can undergo functional testing in the environment for which they were designed. This technology delivers unlimited potential for engineers to create previously impossible solutions, embracing a new era of design-driven manufacturing.



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CONFORMAL COOLING





One of the most effective applications for DMLM Technology is the timely and cost effective creation of production grade tooling inserts. Turn-around times for tooling are reduced from weeks to days, with additional value created by the unique geometric freedom of design. This design freedom provides for the integration of conformal cooling channels, improving the economics of your injection molded parts.

The material of choice for these tooling projects is the Maraging Steel MS1, which meets the

stringent requirements of tool making for serial production, and can be age hardened to approximately 55 HRC. These tools have been used to produce millions of parts in injection molding operations or many thousand metal parts in die casting.

Case studies on conformal cooling have documented reductions in cycle times by as much as 50%, thus improving operational efficiency and lowering unit costs. DMLM technology permits the implementation of efficient tooling, offering designers extended possibilities for the manufacture of high performance tools, without the limitations that characterize conventional processes. Conventional means for producing these types of parts are costly, time consuming and technically complex. During the laser-sintering process, conformal channels are integrated into the tool. This construction advantage improves the productivity of the tools and the quality of your injection molded parts.

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Sample Project: Tri-D and Vulcan-I

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The Tri-D and Vulcan-I projects are an ongoing effort with the SEDS (Students for the Exploration and Development of Space) at the University of California, San Diego. This project has required production of items which are of the level of complexity and in the materials which would be typically necessary in parts requested by military and defense industry clients. The Tri-D project was begun in May 2013 and completed in June of 2013. The rocket was built at GPI through the direct metal laser melting process on an EOS M280 printer in cobalt chrome and was the first additively manufactured rocket engine to fire on the first trial.



The second phase of the project is named Vulcan–1. Through the Vulcan-I Project, SEDS plans on further exploring the feasibility of additive manufacturing in the aerospace industry. This project is an attempt to design, analyze, and test the 1st stage rocket engine of a NanoSat Launcher as well as the parts and fabrication of the launcher itself. By successfully designing, printing, and testing the first and third stage rocket engines, SEDS can theoretically prove that any stage in between can be produced utilizing additive manufacturing, making it an attractive technology for the future of

the aerospace industry. GPI received the CAD file in October of 2014 and started printing the injector plate and rocket body on an EOS M280 printer in February 2015. Printing and secondary operations were completed by the end of June 2015.

GPI was able to provide assistance to the students on both projects. The greatest value that GPI was able to add to the process was through the counsel GPI provided to the students in fine tuning the design of the internal structure of their parts. Multiple conference calls were held in which GPI sales consultants and engineers recommended changes based on past experience with prior projects, advising on ways to achieve interior shapes and geometries which would ensure a better "build." The cumulative history of GPI's work in direct metal laser melting was tapped for relevant experiences that made the SEDS project succeed. The advised changes were made for both projects and the Tri-D rocket was successfully built and tested (video available for each of the tests.) The Vulcan-1 launch will be covered by the Discovery Channel.

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Customer Information: Contract Number • GS-03F-098CA



1a.Table of awarded special item number(s) with appropriate cross-reference to item descriptions and awarded price(s): SIN51.400 3D Printing Solutions

1b.Identification of the lowest priced model number and lowest unit price for that model for each special item number awarded in the contract. This price is the Government price based on a unit of one, exclusive of any quantity/dollar volume, prompt payment, or any other concession affecting price. Those contracts that have unit prices based on the geographic location of the customer, should show the range of the lowest price, and cite the areas to which the prices apply.

1c.If the Contractor is proposing hourly rates, a description of all corresponding commercial job titles, experience, functional responsibility and education for those types of employees or subcontractors who will perform services shall be provided. If hourly rates are not applicable, indicate "Not applicable" for this item: N/A

2.Maximum order: \$750,000.

3.Minimum order: N/A

4.Geographic coverage (delivery area): OCUNUS, CONUS, Alaska, Hawaii, Puerto Rico. Other – contact contractor.

5.Point(s) of production (city, county, and State or foreign country): GPI Prototype & Manufacturing Services 940 North Shore Drive Lake Bluff, IL 60044 Phone: 847-615-8900 Fax: 847-615-8920

6.Discount from list prices or statement of net price: Government prices quoted through RFQ process will include 3% basic discount to standard pricing.

7. Quantity discounts: A volume discount of 15-50% for full build plate (203.2mm x 203.2mm x 285mm) as total quantity will be determined by GPI – contact contractor.

8.Prompt payment terms: Net 30 days

9a.Notification that Government purchase cards are accepted at or below the micro-purchase threshold: Yes

9b.Notification whether Government purchase cards are accepted or not accepted above the micro-purchase threshold: Yes

10.Foreign items (list items by country of origin): None

11a.Time of delivery: Contact contractor – an estimate for delivery time will be determined at time of order.

11b.Expedited Delivery: All items are delivered in most expeditious manner possible; Domestic US is overnight delivery, international shipments are international economy or international priority when requested – contact contractor.

11c.Overnight and 2-day delivery: All items are delivered in most expeditious manner possible; Domestic US is overnight delivery, international shipments are international economy or international priority when requested – contact contractor.

11d.Urgent Requirements: Contact Contractor.

12.F.O.B. point(s): OCUNUS, CONUS, Alaska, Hawaii, Puerto Rico. Other – contact contractor.

13a. Ordering address: GPI Prototype & Manufacturing Services 940 North Shore Drive Lake Bluff, IL 60044 Phone: 847-615-8900 Fax: 847-615-8920 Email: gsasales@gpiprototype.com

13b.Ordering procedures: For supplies and services, the ordering procedures, information on Blanket Purchase Agreements (BPA's) are found in Federal Acquisition Regulation (FAR) 8.405-3.

14. Payment address: GPI Prototype & Manufacturing Services 940 North Shore Drive Lake Bluff, IL 60044 Phone: 847-615-8900 Fax: 847-615-8920

Contact GPI directly for complete pricing: gsasales@gpiprototype.com

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15.Warranty provision: All items are inspected to tolerance prior to shipping.

16.Export packing charges, if applicable: N/A

17. Terms and conditions of Government purchase card acceptance (any thresholds above the micro-purchase level) : Contact Contractor.

18. Terms and conditions of rental, maintenance, and repair (if applicable): $\ensuremath{\mathsf{N}}\xspace/\ensuremath{\mathsf{A}}\xspace$

19. Terms and conditions of installation (if applicable): N/A

20a. Terms and conditions of repair parts indicating date of parts price lists and any discounts from list prices (if applicable): Not Applicable.

20b. Terms and conditions for any other services (if applicable): N/A

21.List of service and distribution points (if applicable): N/A

22.List of participating dealers (if applicable): N/A

23.Preventive maintenance (if applicable): N/A

24a.Special attributes such as environmental attributes (e.g., recycled content, energy efficiency, and/or reduced pollutants). N/A

24b. If applicable, indicate that Section 508 compliance information is available on Electronic and Information Technology (EIT) supplies and services and show where full details can be fund (e.g. contractor's website or other location.) The EIT standards can be found at: www. Section508.gov/. : N/A

25.Data Universal Number System (DUNS) number: 03-933-7654

26.Notification regarding registration in Central Contractor Registration (CCR) database: Registered

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