Incodema Group

We Sell Solutions...

...From Prototype to Production.

Stereolithography (SLA)
Polyjet
FDM
Urethane Casting
DMLS
Metal Stamping & Forming
CNC Machining
Four/Multi Slide
Laser Cutting
Water Jet Cutting
MicroCut
Wire EDM
Photochemical Machining
Production Metal Parts

407 Cliff Street, Ithaca, NY 14850
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SLA/Polyjet

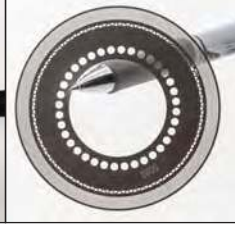

DMLS


Bend & Forming


Machining


MicroCut


Wire EDM


Photochemical Machining

Additive Manufacturing

Stereolithography, SLA

SLA is an additive technology that enables the production of fine detailed three dimensional prototypes and conceptual models from your 3D CAD model. Incodema Group also has a highly skilled finishing department for high quality finishes for all SLA parts upon request.

Fused Deposition Modeling, FDM

FDM utilizes true thermoplastics (ABS, polycarbonate and Ultem) and is an ideal option when you need freedom of design and a high building accuracy. Ideal for functional models, FDM parts lend themselves well to being drilled, tapped, threaded and painted.

Polyjet

Polyjet enables parts with different materials and mechanical and physical properties to be built all in one process. Parts with complex interior features, electronic enclosures and connectors, presentation models and medical devices are ideal for the Polyjet process.

Direct Metal Laser Sintering, DMLS

An innovative additive manufacturing technology using powdered metal to build components directly from any 3D CAD model. DMLS enables the design of internal and external features, such as free form surfaces, deep grooves and three dimensional interior channels, that could not be otherwise machined. Complex geometries and assemblies with multiple components can be simplified into fewer processes and offer nearly unlimited design potential.

Urethane Casting

Cast Urethanes produce parts from a polyurethane plastic material. Urethane parts are very accurate when producing small details and have material properties similar to production plastics and are ideal for short run production and prototypes that require tough physical properties and impact resistance.

Press Brake, Stamping & Forming

Press Brake

With a highly skilled and experienced team, press capacity ranging from 20 to 150 tons and ability to form material from .001” up to .25” thick and 8’ long, Incodema Group can stamp and form your most intricate parts. Coupled with our extensive cutting solution technologies, our press brake team can develop and produce complex parts quickly with the capability to incorporate design changes in real time, if needed. Utilizing the latest in CAD/CAM software and CNC equipment, Incodema Group can produce precise, innovative tool designs that enhance bending and forming capabilities.

CNC Machining & Turning

Using state of the art equipment and software, Incodema Group has a highly skilled and fully equipped machine shop. With 3D machining capability, Incodema Group specializes in complex and technically difficult machined parts that most other shops shy away from. Our CNC engineers work from your 3D CAD model and will assist you throughout the process of building your part to ensure it meets or exceeds requirements.

Capabilities include:

- Turning
- Milling
- Grinding
- Wire EDM & RAM
- Part Assembly
- CMM Inspection

Cutting

Laser

Lasers hold tolerances of +/-.002 in. with a material size capacity of 5 x 10 ft. sheets. With an enhanced conductivity sensor, Incodema Group is able to follow varying surface contours, allowing for secondary cutting to drawn, embossed and gently curved parts.

Water Jet

Abrasive water jets are ideally suited for heavy gage applications and with materials such as aluminum, steel, titanium, inconel, brass, tool steel, glass, stone or composites. Our water jets are paired with a dynamic head, eliminating taper and hold tolerances of +/-.005 in. to +/-.001 in. with cutting material thickness of .0625 in. to 8 in.

MicroCut

The MicroCut process can cut a wide range of materials, including heat sensitive types, with a cutting accuracy of +/-.0004 in. and a positioning accuracy of .0001 in. MicroCut quickly and accurately removes material to produce a finished piece with little to no burr and no heat deformation.

Wire EDM

An electro thermal production process used to cut through metal by the use of heat from electrical currents. Wire EDM is highly precise and ideal for very hard materials, intricate geometries and tooling. With an experienced team, three Wire EDM machines and 5 axis cutting capability enabling taper cuts, use of thicker work pieces (up to 6”) and increased accuracy Incodema Group provides cutting solutions for all your parts.

Photochemical Etching

A unique high precision manufacturing technology that allows for intricate patterns and tight tolerance parts from prototyping to production runs. This process is ideal for filters, screens, encoders, contacts, shielding and thermal planes. Additional features, such as ID marks, may be added for no added cost. Some of the advantages of Photochemical Machining include: low tooling cots, no burring and ability to preserve metal properties.

Production Facility

Incodema Group has a fully equipped machine and tool company specializing in close tolerance metal workings to take you from short to high volume runs. Well planned, streamlined and efficient with the same quality and attention to detail, our highly skilled production division will react quickly to satisfy your production needs. Providing you with highly innovative and customized precision metal parts. Incodema Group’s production facility is prepared to custom tool and automate for consistent throughput. Manufacturing capabilities include:

- Precision Stamped and Drawn parts
- Four/Multi Slide
- CNC machining
- Precision Sheet Metal Fabrication
- Part Assembly

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INCODEMA
SHAPING THE FUTURE

Incodema3D is an additive manufacturing company that will be located in Ithaca, New York, producing plastic and metal prototypes and end-use parts for OEMs. Engineers use these parts to tangibly measure and ensure that their design will succeed. Additive manufacturing (commonly referred to as "3D Printing") in plastics uses a laser, building up the object layer by layer, to create intricate parts. A similar, but emerging, technology is available to create metal prototypes using metal powder and lasers. With the use of the internet and computer design programs, a part can transform from an engineer's idea to an actual component within hours. Incodema3D will use both technologies to create many parts not previously possible using older technologies.

Background

Incodema3D will be a new, spin-off company from two existing sister companies. Incodema, Inc. is a rapid prototype manufacturer in existence for 12 years, while Iwin-RP was started in 2012 for plastic additive manufacturing. Sean Whittaker solely owns both companies. In early 2013, Incodema added metal additive manufacturing to its operations and has been developing processes, and capabilities in that area. Incodema3D will carve out the new metals additive manufacturing from Incodema and consolidate with Iwin-RP operations under one roof to be located in Ithaca, NY. Under the Start-UP New York program, Whittaker has invited a group of highly recognized industry leaders to join him in creating this world class additive manufacturing company.

Opportunity

Although an established industry, technologies continue to develop and Incodema3D will have the full range of technologies available to meet customers' needs. The plastics industry, until recently, has been centered on prototype parts made with limited materials that are fragile and useful only for testing fit and function. Advances in both processes and materials have allowed plastic additive machines to produce end-use parts with properties durable enough to be used even in airplanes.

The metals industry is an emerging technology. A significant opportunity was created earlier this year when GE Aviation bought out Morris Technologies to bring Morris' machines in-house for GE's own use. It is estimated that removing Morris' 30 machines removed over 50% of the machines in the contract metal additive manufacturing market. This leaves only a few players, with the current 'leading company' having just seven machines.

Competitive Advantage

Our competitive advantage will be based on three core pillars: personalized customer service, rapid turnaround, and high quality products. By acquiring a full range of machines we will be able to offer a wide variety of materials and processes on demand, and by being able to dedicate certain materials to individual machines, will be able to reduce turnaround time by avoiding lengthy machine cleaning for materials change outs.

Personalized customer service is achieved by hiring employees with extensive experience in the industry and emphasizing the educational component of guiding a customer through the process of manufacturing options and requirements.

High quality products are achieved by creating a culture of excellence, and by providing adequate secondary machinery to finish and check to the part to exceed customer expectations.

Industry analysts cite cost, development processes and limited material type availability as continued challenges in the development of the additive manufacturing industry. By fostering strategic partnerships detailed below, Incodema3D is poised to meet the challenges of materials cost, material type availability and processes head on to become the leader in the industry.

Strategic Partnerships

In the metals arena, additive manufacturing is still a young, developing technology. The Incodema3D team has been working to create strategic partnerships to position itself as a leader in the arena. In terms of developing processes, Cornell University will be a strong ally. The Creative Machines Lab at Cornell, headed up by additive manufacturing expert Hod Lipson, will lend its research and development abilities using our machines and working to meet customer requests for new processes. Two strategic partnerships are already in place with customers to develop materials and processes that fit their needs. Both customers have made a commitment to additive manufacturing and as they adapt existing products or design new ones, they will partner with Incodema3D to tap our institutional knowledge on effective processes and work with us to develop new materials. Cornell's Materials Science and research division and local materials development and testing labs will be instrumental in developing new materials beyond the limited metal powders and resins currently available. Incodema3D's hometown of Ithaca, NY is the site of several highly regarded testing facilities that will allow us to not only certify our powders, but complete state-of-the-art testing as we develop new processes and materials. These partnerships will not only expand the range of materials, but by developing our own powders and resins, Incodema3D will be able to reduce the raw materials cost.

Incodema3D is part of the Incodema Group, a group of four sister companies with ownership ties. These four companies, including Incodema, Newchem Inc. dba Newcut, and Engineering Manufacturing Technologies (EMT) have grown so that their combined efforts offer a diversified set of technologies to meet customers' needs. Newchem Inc. offers 30 years of experience in photochemical machining to produce intricate, thin-metal parts. Incodema Inc. is a leader in the metal prototyping industry using state-of-the-art machinery and powerful software to create custom parts. EMT is a production facility, able to produce large quantities of parts. Together with Incodema3D, these companies have the combined expertise and abilities to be leaders in the industry.

Industry Overview

The industry for additive manufacturing as a whole is still relatively new. The technology for plastic additive manufacturing has been in existence for over two decades and the market has become increasingly competitive. However, according to Time magazine, the annual growth rate is still around 14%. While the technology for metal printing is still in the infant stage, it shows tremendous promise. The values provided by additive manufacturing, compared to traditional methods, are speed and complexity. Given the abundance of large and established industries that could utilize both plastic and metal additive manufacturing—automotive, aerospace, consumer goods, manufacturing, medical, defense, commercial, and education—the expansion opportunities for the industry are plentiful and profitable.

Team

LLC Members

Incodema3D, LLC is equally owned by Sean Whittaker, Jim Kirkwood, Maynard Fahs, and Greg Galvin. They currently are co-owners of Engineering Manufacturing Technologies (EMT), a production sheet metal manufacturer based in Endicott, NY with approximately 135 employees.

Sean Whittaker will take on the role of Chief Executive Officer within Incodema3D. He has extensive experience in prototype manufacturing having founded Incodema, Inc. in 2001, purchased Newcut Inc. in 2011, and started I Want It Now – RP, Inc. (Iwin-rp) in 2012 with a combined workforce of 90 employees. Incodema, Inc. is a rapid prototype manufacturing company specializing in quick turnaround and creating intricate parts using the latest technologies. Newchem Inc. is a photochemical machining company in existence for 30 years. Newchem achieved record sales in the first full year of operations. Iwin-rp was founded to take advantage of the burgeoning market in plastic 3D printing and additive manufacturing.

Greg Galvin has a B.S. in Electrical Engineering, Ph.D. in Materials Science and an M.B.A. He was the

Deputy Director of Cornell Nanofabrication and Director of Corporate Research Relations prior to founding Kionix in 1993. Kionix, founded to develop micromechanical technology and the optical switching technology, was sold in 2000 to Calient Networks while maintaining inertial sensor and data storage technology under the corporate name. In 2008, their polymer chip microfluidic technology was spun out under the corporate name of Rheonix, while the remaining Kionix company was sold to Rohm Co. Ltd. of Japan. Mr. Galvin currently holds the position of Cornell Trustee.

Maynard Fahs is the president and CEO of Fahs Construction Group Inc. and the founder and CEO of Hearth Management LLC. Fahs Construction boasts $200 million in sales with nearly 400 employees, while Hearth Management's 12 assisted living facilities can be found in four states, operating 1,500 units with revenue of $40 million. Mr. Fahs is also a partner in Oryx Insurance Brokerage, Windsor Manufacturing, and Endicott Machine and Tool. He was nominated for the Ernst and Young Entrepreneur of the Year award for construction and development in 2003.

Jim Kirkwood is a C.P.A. and is currently the Chief Executive Officer of Endicott Machine and Tool (EMT), a stamping, machining and sheet metal production company. He negotiated the purchase price, and with improved efficiencies and agreements and protocols has been able to more than double Sales and Net Income as percentage of Sales in the first ten months. Previously, Mr. Kirkwood was the Executive Vice President of Kionix., a high tech manufacturer of micro-electro mechanical systems. Before Kionix, Mr. Kirkwood was the CEO of Wilcox Press, and the Controller of Pyramid Companies.

Operating team

The operating team will be headed up by Sean Whittaker as CEO. Scott Volk, Dan Sammons and James Hockey are industry leaders in their respective areas of expertise. With over 60 years of combined experience, Incodema3D will have expert institutional knowledge to operate at the highest level. Please see the attached brief resumes.

Summary

Incodema3D plans to rapidly acquire 50 metal machines and over 50 plastic machines. Years of industry experience will allow Incodema3D to develop strong relationships and rapidly advance. Together with its strategic partners, Incodema3D is poised to quickly become the industry leader.

Operating Team Leaders

Scott Volk

Scott Volk is an industry expert in both the plastic and metal additive manufacturing industries with over 20 years' experience. At Laser Modeling Inc. and Scicon, Mr. Volk was involved in all aspects of SLA and RTV processes including materials development, quality, training and estimating. Prior to joining Incodema3D, Mr. Volk was the Vice President of Manufacturing at GPI Prototype, with extensive experience in researching and development in Direct Metal Laser Sintering (DMLS). He was responsible for all aspects of DMLS, including manufacturing engineering, continuous improvement, risk assessment and certifications. Mr. Volk's experience allows him to create complex parts that others don't dare attempt and can work with strategic partners to develop materials and processes to meet new demands.

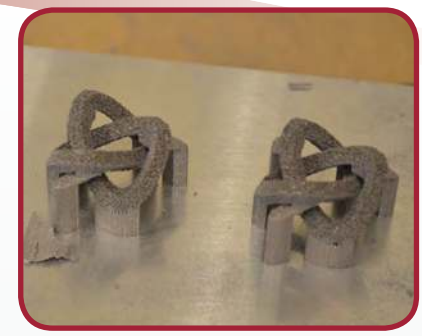
James Hockey

James Hockey is an accomplished sales professional with an outstanding record of success. Totaling over 20 years' experience in all facets of customer relations in the manufacturing/project management/technical sales field. He is able to manage projects from cradle to grave. Mr. Hockey started his additive manufacturing industry experience at Laser Modeling Inc., and continued to expand his knowledge at GPI Prototype, Neomek Inc., and Directed Manufacturing

Dan Sammons

Dan Sammons is a leading expert in the plastic additive manufacturing industry. Prior to joining Incodema3D, he was a founder of DPT, Inc. in Syracuse, NY a leading provider of SLA, FDM, and SLS processes. Mr. Sammons has extensive experience Beta testing resins. Recently, he has been working with a cancer institute to convert MRIs to a 3D physical representation using Polyjet for medical education, patient relationship and surgical planning. With 20 years of experience, Mr. Sammons joins Incodema3D as the director of plastic additive manufacturing.

Metal Additive Manufacturing



Direct Metal Laser Sintering
DMLS

An innovative additive technology enabling unlimited design for metal parts.

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ITAR International Traffic in Arms Regulation Certified

DMLS Process

DMLS is an additive manufacturing technology that builds components directly from any 3D CAD model. Powdered metal is dispersed across the machine's base plate in 20 micron layers, allowing for high detail resolution, and fused together by using a focused laser beam. With this technology, objects with complex geometries can be built, while reducing time and cost of conventional manufacturing. DMLS parts require no post sintering or other infiltration process.

To compliment our DMLS machine, we have a highly skilled and fully equipped in house machine shop. Our experienced engineers post process the components, providing surface finish and any additional feature each component requires.

Advantages of DMLS

DMLS has many benefits over traditional manufacturing techniques:

- Strong and durable components (produce metal components that are 99.8% dense)
- Rapid prototypes
- No tooling, reducing cost
- High quality
- High accuracy in fine details
- Complex geometries
- Weight Reduction with built in internal chambers
- Excellent for functionality testing - allow for more rigorous testing of prototypes
- Some parts can be built in a matter of hours

Materials

The DMLS system can process a wide range of materials; from light metals to stainless and tool steel to super alloys:

- Stainless Steel (PH1) (15-5 equivalent)
- Stainless Steel (GP1) (17-4 equivalent)
- Aluminum (AlSi10mg)
- Maraging Steel (MS1) (Tooling Steel)
- Titanium Alloy Ti-64 (Pre-Alloyed Ti6AlV4)
- Cobalt Chrome (MP1) (High Carbon CoCr Alloy)
- Inconel (718 and 625 Alloy)

Any Shape, Any Design

DMLS technology builds your design directly from 3D CAD data. Components are built layer by layer, enabling the design of internal and external features, such as, free form surfaces, deep grooves and three dimensional cooling channels, that could not be cast or otherwise machined. Complex geometries and assemblies with multiple components can be simplified into fewer processes and offers nearly unlimited design potential.

"Green" Manufacturing

DMLS makes more with less, reducing waste, cost, lead times, energy and material input with its additive manufacturing technology. Additive technology enables parts to be constructed with greater structural stability than those produced with traditional machining techniques while producing lightweight products; reducing transportation costs and increasing fuel efficiency.

Unlike subtractive manufacturing, additive manufacturing does not leave unused cut off stock. DMLS saves energy by eliminating the production steps of traditional machining, using substantially less waste, enabling the reuse of by products to produce accurate and lighter products with improved performance and functionality.

Applications

- Prototyping
- Aerospace
- Dental
- Automotive
- Medical Instruments/ Surgical Implants
- Research & Development
- Art/Jewelry

DMLS Specifications

- Building Volume (including building platform): 250mm x 250mm x 325mm (9.85" x 9.85" x12.8")
- Laser type: Yb - fiber laser, 400W
- Layer thickness: 0.0008" - 0.003"
- Accuracy: +/- 0.002"

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I Want It Now!

Turnkey prototype assemblies with integrated SLA, sheet metal parts and CNC machined parts. Fully assembled and guaranteed.

- Instant quotes
- Next Day delivery
- Custom finishes - including sanding
- Dedicated account manager
- Staffed with an average of over 10 years industry experience

PROCESSES:

SLA
Polyjet
SLS
DMLS
FDM
Urethane Casting
Investment Casting
Sand/Plaster Casting

IWIN RP RAPID PROTOTYPING DIVISION OF INCODEMA GROUP

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IWIN-RP division of Incodema Group
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ADDITIVE MANUFACTURING

Incodema Group is pleased to introduce **Iwin-RP**, a company for all your additive prototyping needs. We specialize in stereolithography (SLA), an additive manufacturing process for rapid production. **Iwin-RP** can create your prototype assembly **including plastic, sheet metal and CNC machined components**. Iwin-RP's experienced staff will fully assemble and guarantee all assemblies to be delivered to your specifications.

Our Processes

- Stereolithography (SLA)
- POLYJET
- Selective Laser Sintering (SLS)
- Direct Metal Laser Sintering (DMLS)
- Fused Deposition Modeling (FDM)
- URETHANE
- INVESTMENT CASTING
- SAND/PLASTER CASTING
- SHEET METAL
- CNC MACHINING

Technology Advantages

- Rapid Prototyping
- High quality manufacturing
- Intricate prototyping capabilities
- Quick quotation response
- Regional same day delivery
- Superior customer service
- Finished with great care

Applications

With rapid and intricate forming capabilities, SLA technology can be used in many industries including:

- Communications
- Medical Technology/Tools
- Aerospace/Defense
- Energy

SLA Material Specifications*

Somos WaterShed XC 11122

Appearance	Almost Colorless
Density	1.12g/cm^3 at 25˚C
Viscosity	260 cps at 30˚C

Somos NeXt

Appearance	White
Density	~1.17g/cm^3 at 30˚C
Viscosity	~1,000 cps at 30˚C

PolyJet Materials*

With a range of more than 100 materials, including as many as 90 digital materials, Incodema Group's Objet500 Connex enables you to simulate diverse mechanical and physical properties, from rubber to rigid; opaque to transparent; and standard to ABS-grade.

FDM Materials*

Incodema Group's Fortus 400mc has the ability to build parts in nine production-grade engineering thermoplastics:

- ABS ESD6
- ABSi
- ABS M30
- ABS M30i
- PC
- PC ABS
- PC ISO
- PPSF

DMLS Materials*

Utilizing powdered metal, Incodema Group can process a wide range of materials; from light metals to stainless and tool steel to super alloys:

- Stainless Steel 15-5 PH
- Stainless Steel 17-4 PH
- Aluminum
- Maraging Steel
- Titanium Alloy
- Cobalt Chrome
- Inconel

Please talk to Incodema Group team member about material specifications

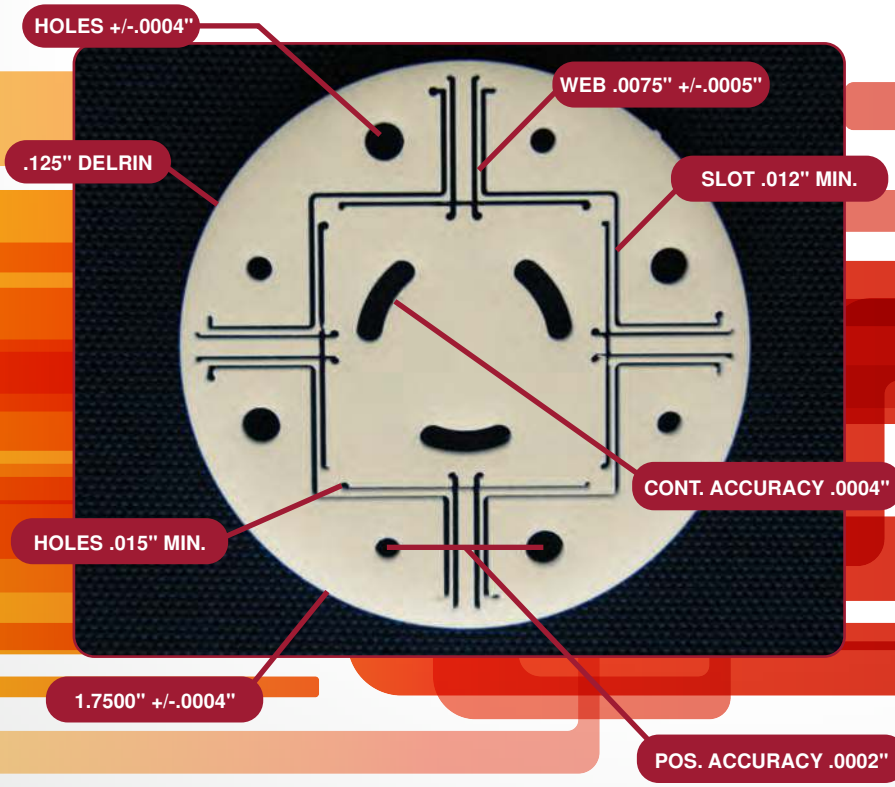
► High Quality Prototypes
► Rapid Turnaround
► Attention to Detail
► Superior Customer Service

MICROCUT™

The Future of Precision Cutting

INCODEMA presents a revolution in manufacturing process. From prototype to production runs, MICROCUT™ provides the precision you need with the quality you expect.

- Accurate within +/-0.0004 in.
- Kerf width 0.008" - 0.0196"
- Materials from flexible plastic to hardened alloys



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MICROCUT™ technology offers the following technological advantages:

- Able to cut materials from plastic to hard alloys
- Fast prototype production
- Flexible production, “Just in time” fabrication
- High cutting speeds
- High cutting accuracy
- High surface quality
- Optimal material usage
- Low cutting forces (load)
- No thermal Impact (heat)
- No change in material structure
- Narrow kerf width
- Minimal secondary finishing

MICROCUT Specifications

MICROCUT’s micromachining technology provides higher cutting accuracies and tighter tolerances than standard cutting processes:

- Positioning accuracy 0.0001 in. (0.003 mm)
- Contouring accuracy +/- 0.0004 in. (0.01 mm)
- Kerf width 0.008 in. (0.203 mm)
- Kerf width 0.0196 in. (0.5 mm) with abrasive
- Maximum work piece size 24 x 39 inches (600 x 1000 mm)
- Material thickness: 0.0005” - 0.250”, material dependent

MICROCUT operates without generating heat affected zones, allowing material composition to remain unaltered. Superior edge quality and minimal burr is achieved, resulting in no distortion or stress.

In comparison, wire EDM and laser cutting technologies as thermal processes, make it impossible to produce such high precision results without affecting material molecular makeup.

Process Comparison

The MICROCUT process was specifically designed to machine two-dimensional, high precision and micro parts with a substantially smaller kerf width (0.008 in.) compared to traditional cutting processes (0.045 in.) that are primarily used to cut or rough out large shapes and/or thicker materials.

More competitive with EDM and Laser Cutting, MICROCUT cuts without Heat Affected Zones (HAZ).

Applications

MICROCUT is an excellent alternative cutting method to traditional machining for a wide range of materials as compared to EDM or Laser Cutting. The applications are very broad across multiple industries including:

- Prototyping
- Research & Development
- Electronics
- Automotive/Motorsports
- Medical Technology/Tools/Implants/Components
- Aerospace/Defense
- Art/Jewelry
- Scale Models

MICROCUT Technology – The Process

We use proprietary equipment developed in Europe to cut a wide range of materials, including heat sensitive types, with a cutting accuracy of +/-0.0004 in. (0.01mm) and a positioning accuracy of +/-0.0001 in. (0.003mm). This cutting process quickly and accurately removes material to produce a finished piece with little to no burr and no heat deformation. It is an ideal solution for soft materials such as rubber or silicone.

With our process, there are low occurrences of process forces and thermal stress. With these properties even the most delicate contours can be cut. Due to the small diameter of the cut it is possible to create sharp-edged contours. And, with the cutting diameter being less than 0.008 in.(0.203mm), a very high material efficiency is achieved.

Typical Substrates ideal for MICROCUT machining include:

- Metals - Stainless Steel, Steel, Gold, Silver, Titanium, Chromium, Nickel, Cast Iron, Aluminum, Brass, Bronze, Copper, Alloys
- Glass - Un-tempered, Bullet-proof, Mirror
- Plastic - Thermo, Curable, Elastomer, Plexiglass
- Stone - Ceramic, Granite, Marble, Quartz, Precious Stone
- Miscellaneous - Rubber, Kevlar, Carbon Fiber, Fiberglass, Graphite

What advantages does MICROCUT Cutting have over other forms of cutting?

- Fast transition from design to cutting
- Faster setup and cutting speed with higher accuracy
- Minimizes secondary cleaning operations
- Small kerfs
- Ideal for quick prototype, flexible production and proven for high volume production
- Optimum material utilization with CAD/CAM software

MICROCUT™

The Future of Precision Cutting

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INCODEMA SHAPING THE FUTURE

MICROCUT™ vs. Wire EDM

technology comparison

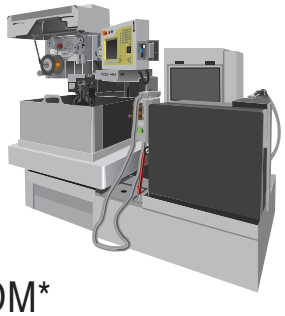
Incodema Group strives to be a collaborative partner, providing customers with a variety of technology solutions, enabling their innovative and forward thinking to provide you with the right process for your part. MicroCut™ has brought new meaning to rapid manufacturing and precision cutting. This exciting new technology is ready to deliver results. This copper coil, is just one example of how MicroCut™ is redefinig the rules and **shaping the future** for designers and engineers.

per part

MicroCut™

The combination of accuracy and speed makes the MicroCut™ technology for processing parts of any material with intricate features. Using the MicroCut™ technology resulted not only in faster manufacturing time, but significant cost savings.

- Precision - with a kerf width of 0.009"-0.0118" and accuracy within +/-0.0004" MicroCut™ provides the accuracy to fabricate the small features of this part.
- Speed - with the capability of cutting 15.0" per minute with a material thickness of 0.050" for this copper coil. The speed of MicroCut™ results in a 50.0"/min difference compared to 0.010"/min using wire EDM.
- Cuts **without** Heat Affected Zones (HAZ).
- MicroCut™ technology enhances the appearance of the final part, requiring no post processing.



per part

Wire EDM*

For this copper coil, limitations exist in utilizing Wire EDM, due to being both labor and time intensive, resulting in longer lead times and increased cost.

- Blanks must first be cut and then 36 start holes are machined.
- For the intricate geometries of this part, a 0.006" wire will be used, preventing the efficient use of stacking.
- Due to the material thickness of 0.050"; cut speed is significantly reduced

With the requirements of this copper coil, Wire EDM was not an ideal solution for this part. Wire EDM capabilities could not be maximized and despite higher quantities, there will be minimal cost reductions and extended lead times.

**Wire EDM offers exceptional accuracy for cutting very hard materials such as, tool steel, intricate geometries, making die sets with taper cuts and modification of mill and lathe tools for custom applications.*

cost comparison

Qty.	MicroCut	Wire EDM
1	$267.18	$1,440.18
10	$142.43 (tot.=$1,424.30)	$1,288.01 (tot.=$12,880.10)
20	$126.14 (tot.=$2,522.80)	$1,233.14 (tot.=$24,662.80)

costs include engineering and set up

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- Fast prototype production
- Flexible production, “Just in time” fabrication
- High cutting speeds
- High cutting accuracy
- High surface quality
- Optimal material usage
- Low cutting forces (load)
- No thermal Impact (heat)
- No change in material structure
- Narrow kerf width
- Minimal secondary finishing

MICROCUT Specifications

MICROCUT’s micromachining technology provides higher cutting accuracies and tighter tolerances than standard cutting processes:

- Positioning accuracy 0.0001 in. (0.003 mm)
- Contouring accuracy +/- 0.0004 in. (0.01 mm)
- Kerf width 0.008 in. (0.203 mm)
- Kerf width 0.0196 in. (0.5 mm) with abrasive
- Maximum work piece size 24 x 39 inches (600 x 1000 mm)
- Material thickness: 0.0005” - 0.250”, material dependent

MICROCUT operates without generating heat affected zones, allowing material composition to remain unaltered. Superior edge quality and minimal burr is achieved, resulting in no distortion or stress.

In comparison, wire EDM and laser cutting technologies as thermal processes, make it impossible to produce such high precision results without affecting material molecular makeup.

Process Comparison

The MICROCUT process was specifically designed to machine two-dimensional, high precision and micro parts with a substantially smaller kerf width (0.008 in.) compared to traditional cutting processes (0.045 in.) that are primarily used to cut or rough out large shapes and/or thicker materials.

More competitive with EDM and Laser Cutting, MICROCUT cuts without Heat Affected Zones (HAZ).

Applications

MICROCUT is an excellent alternative cutting method to traditional machining for a wide range of materials as compared to EDM or Laser Cutting. The applications are very broad across multiple industries including:

- Prototyping
- Research & Development
- Electronics
- Automotive/Motorsports
- Medical Technology/Tools/Implants/Components
- Aerospace/Defense
- Art/Jewelry
- Scale Models

MICROCUT Technology – The Process

We use proprietary equipment developed in Europe to cut a wide range of materials, including heat sensitive types, with a cutting accuracy of +/-0.0004 in. (0.01mm) and a positioning accuracy of +/-0.0001 in. (0.003mm). This cutting process quickly and accurately removes material to produce a finished piece with little to no burr and no heat deformation. It is an ideal solution for soft materials such as rubber or silicone.

With our process, there are low occurrences of process forces and thermal stress. With these properties even the most delicate contours can be cut. Due to the small diameter of the cut it is possible to create sharp-edged contours. And, with the cutting diameter being less than 0.008 in.(0.203mm), a very high material efficiency is achieved.

Typical Substrates ideal for MICROCUT machining include:

- Metals - Stainless Steel, Steel, Gold, Silver, Titanium, Chromium, Nickel, Cast Iron, Aluminum, Brass, Bronze, Copper, Alloys
- Glass - Un-tempered, Bullet-proof, Mirror
- Plastic - Thermo, Curable, Elastomer, Plexiglass
- Stone - Ceramic, Granite, Marble, Quartz, Precious Stone
- Miscellaneous - Rubber, Kevlar, Carbon Fiber, Fiberglass, Graphite

What advantages does MICROCUT Cutting have over other forms of cutting?

- Fast transition from design to cutting
- Faster setup and cutting speed with higher accuracy
- Minimizes secondary cleaning operations
- Small kerfs
- Ideal for quick prototype, flexible production and proven for high volume production
- Optimum material utilization with CAD/CAM software

MICROCUT

The Future of Precision Cutting

407 Cliff Street, Ithaca, NY 14850
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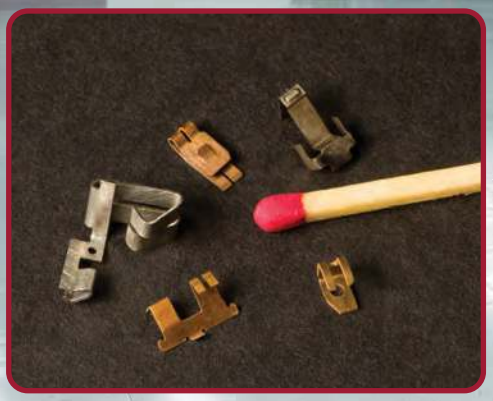
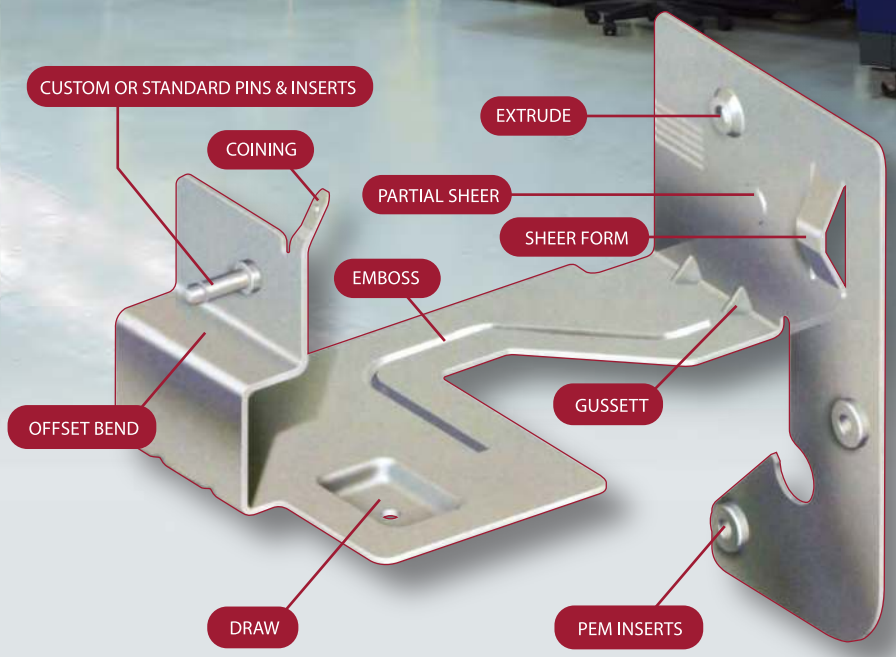
Rapid Prototype Stamping, Forming & Bending

INCODEMA GROUP

SINGLE SOURCE PROVIDER.

- High Precision
- Fast Turnaround
- Prototype to Short Run Production





ITAR

The INCODEMA GROUP Advantage

- Total Value, Speed & Accuracy – we make it right the first-time, and usually faster than our competitors can give you a quote
- Turnkey Operation – from raw materials to shipping
- Constant Customer Communication & Collaboration
- Lean Management & 5S
- ERP Quoting System – real-time web-based quote and customer interaction during development

INCODEMA GROUP's Development Processes

By utilizing standardized tools and techniques, we are able to form most parts easily, but what gets our team really excited are challenges that require new processes; this is our area of expertise. The wide range of processes we currently offer:

- Laser Etching
- Contouring
- Forming
- Coining
- Partial Shears
- Deburring
- Plating
- Screenprinting
- Tapping
- Riveting
- Laser Cutting
- Microcut
- Laser Welding
- Bending
- Gusseting
- Knurls
- Miniature Components
- Heat Treating
- Powder Coating
- Welding
- Hardware Install
- Deep Draw
- Waterjet
- Machining
- Mass Spectrometer Helium Leak Testing

Specializing in many types of parts:

- Miniature-Micro
- Brackets
- Shields
- Chassis
- Drawn parts
- Weldments
- Connectors
- Springs
- Contacts

Specializing in working with many materials including:

- Carbon Steel
- Aluminum
- Beryllium Copper
- Molybdenum
- Indium
- Titanium
- Brass
- Plastics
- Films
- Stainless Steel
- Phos. Bronze
- Nickel Alloys
- CRS/HRS
- Mu-metal
- Inconel
- Copper
- Mylar
- Circuit Boards

INCODEMA GROUP serves many industries:

- Energy
- Appliance
- Aerospace
- Education
- Medical
- Electronics
- Automotive
- Defense
- R&D prototyping
- Yours

INCODEMA GROUP Facilities & Equipment

Our climate-controlled stamping and forming laboratory has 15 presses with capabilities ranging from 20 to 150 tons.

Incodema Press Brakes At A Glance:

- Perform bends up to 8' long
- Bend material up to .250" thick
- CNC controlled multi-axis bending
- Tolerance Standard +/-.003 (added cost) to +/-.010
- Fast Setup / Conversational Control Programming

BAL-TEC	Toyokoki	Simco	Nilson	Niagara
• PWS 640	• APB 3613W • APB 3613W • APB 3613W • APB 8025W • APB 286U • APB 286U • APB 184	• 4SM-38T • WF-255 • WF-355	• 700L • 700L • 700LV	• 150-84-36

INCODEMA GROUP Tooling

We have a complete inventory of in-house tooling that ranges from industry standard to custom made proprietary tooling. An in-house tooling department enhances quality control and delivery time. Most custom tooling can be produced in less than one hour. Visit our website for more information.

- Standard V Tooling
- Form Tooling
- Multi-slide tooling
- Custom Tooling
- Draw Tooling

CAD

Computer Aided Design is the language and lifeblood of the shop. Every press operator has the ability to access and launch CAD/CAM with 3D models at every station.

File Capabilities:

- Pro-E • Solidworks • Mastercam
- IGES • DXF • SAT • DWG

Quality Control at INCODEMA

Our policy is that every technician is a QC inspector. Two people designated as Quality Control Managers ensure that all parts meet or exceed requirements.

CMM inspection:

- Dimensional measurement and verification
- Profile measurement
- Depth mapping
- Digitizing and part mapping
- Angularity and orientation measurement

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SINGLE SOURCE PROVIDER.

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Photochemical Machining

- High Precision
- Fast Turnaround
- Prototype to Production

MATERIALS:

Aluminum
Beryllium Copper
Brass
Carbon Steel
Copper
Inconel
Molybdenum
Nickel Silver
Silicon Steel
Stainless Steel
Titanium
Zirconium

Incodema can make parts from a wide variety of metals in thicknesses from .0005" to .125" in panels up to 40" x 60".

We use photochemical machining to provide burr-free parts with low cost tooling and fast turnaround from prototype to production.

Our secondary forming capabilities; heat treating, and plating assure you that your project need not move from vendor to vendor.

Incodema has been a producer of quality parts for over forty years. We are eager to meet your precise requirements. Our engineers encourage idea exchanges to provide exactly what you need, when you need it, using the best processes.

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Photo Chemical Machining (PCM) is a technology that produces precision flat metal parts for prototyping and production.

PCM is also referred to as Photo Chemical Milling, Photofabrication, Photo Chemical Etching, Chemical Blanking and others. The PCM process can simply be described as using photography and chemicals to craft parts from thin sheet metals.

Advantages of PCM

- Low tooling costs
- Minimal modification cost
- Small, intricate patterns with tight tolerances
- Complex features do not add to price per unit
- Prototype to production with no change to process or method
- Integrity of metal properties is preserved
- No Burring
- No cost to add ID marks
- Half-etch process available

PCM Process

- Engineering the design
- Cleaning the metal surface
- Coating with the light sensitive polymer
- Exposing UV light through the film tool to set the design on the metal sheet
- Developing, removal of unwanted polymer
- Etching, removal of unwanted metal
- Stripping of photoresist
- Quality Control
- Forming, Heat Treating and Plating
- Final Product

While nearly all metals can be used in PCM, the following classes are typical:

- Aluminum
- Beryllium Copper
- Cold Rolled Steel
- Lead
- Stainless Steel
- Nickel Silver
- Aerospace material
- Brass
- Copper
- Phosphorus Bronze
- Titanium
- Spring Steel

PCM Specifications

- Thickness from 0.0005 in. (0.013 mm) to 0.1 in. (2.5 mm)
- Parts quantity from 1 to infinity
- Minimum piece size 0.040 in (1.02 mm) square
- Maximum piece size 40X60 in. panels

PCM Tolerances

- Tolerance Standard: +/-.003 (added cost) +/-.0005
- Dimensions are limited by the artwork
- Etched Dimensions are generally ±10% of the metal sheet thickness
- Sharp Corners tend to round off
- All edges are beveled as a result of the process
- Line widths are thinner at the surface

PCM part dimensions always are dependent upon the thickness of the metal

- Hole size cannot be smaller than thickness
- Line width is at least equal to the metal thickness up to 0.005 in. (0.127 mm)
- Line width must be 125% if the metal thickness is over 0.005 in. (0.127 mm)
- Inside corner radius generally 100% of thickness
- Outside corner radius generally 75% of thickness

CAD

Computer Aided Design is the language and lifeblood of the shop. Every operator has the ability to access and launch CAD/CAM with 3D models at every station.

File Capabilities:

- Pro-E
- Solidworks
- Mastercam
- AutoCad
- IGES
- DXF
- SAT
- DWG

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