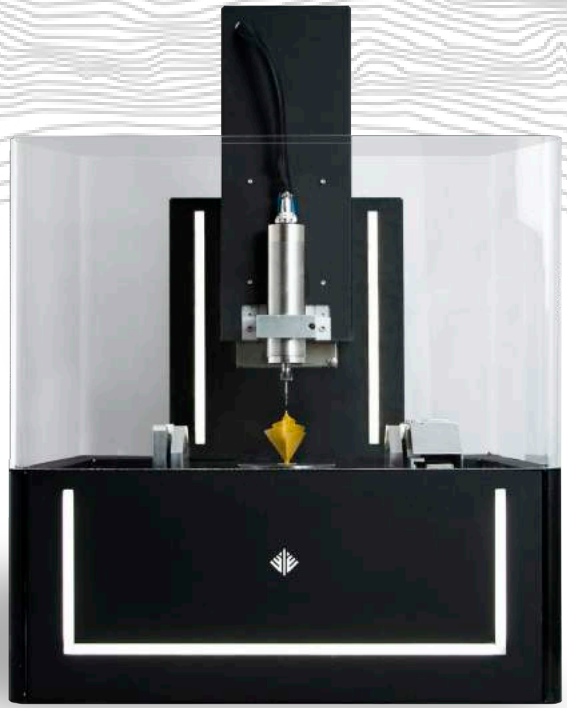


THE ETHEREAL HALO

The Word's First Desktop Simultaneous 5-Axis CNC and 3D Printer

APPLICATIONS

ETHEREAL

ABOUT THE MACHINE

The Ethereal Halo has been designed to bring about a metamorphosis to the world of manufacturing and kick off the concept of hybrid manufacturing. Ethereal Halo is the world's first consumer oriented 5-axis 3-D printer and 5-axis CNC Router.

Ethereal Halo is a machine that introduces Hybrid Manufacturing to the world and combines both the technologies of subtractive manufacturing and additive manufacturing into one bundle, with a high degree of accuracy.

The Halo can equip an entire spectrum ranging from the hobbyist to an industry with quick prototyping and manufacturing abilities. A 5-axis printer and a 5-axis CNC Router bundled up into one single affordable machine heralds the future.

MAJOR FIELDS OF APPLICATION

Rapid Prototyping

Direct Manufacturing

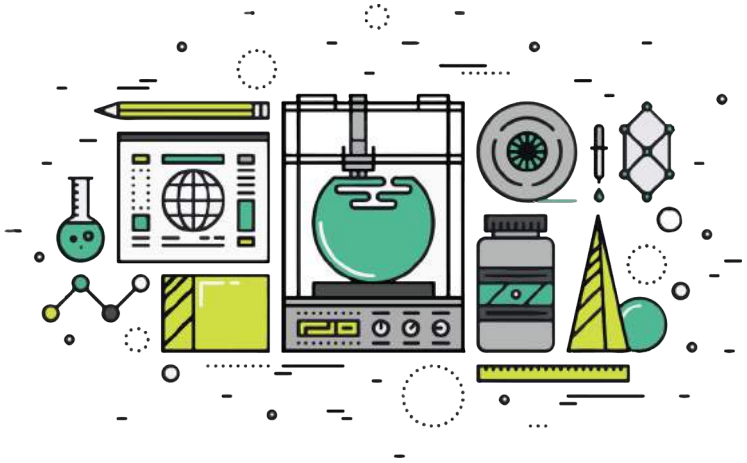
Aid in Manufacturing Process

Supplement in Manufacturing Process

RAPID PROTOTYPING

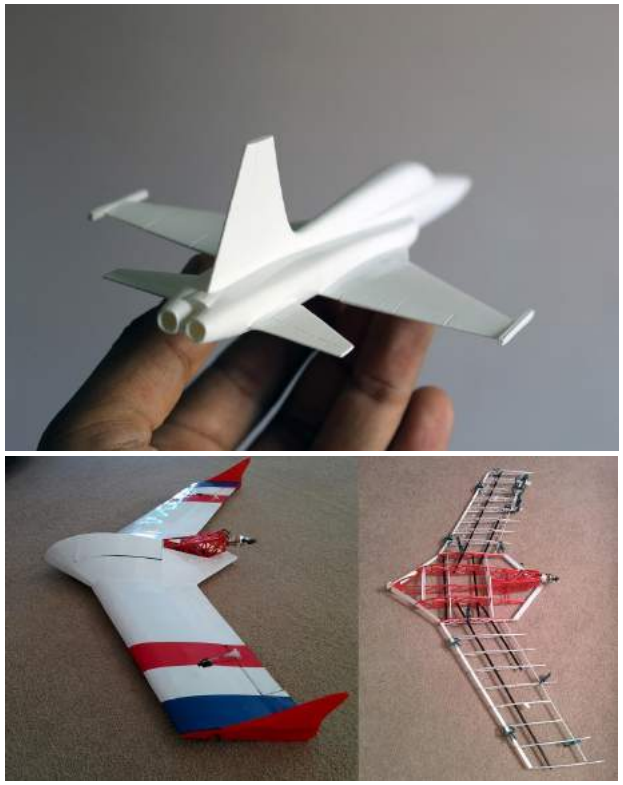
Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data and a rapid manufacturing technique.

In manufacturing, rapid prototyping is used to create a three-dimensional model of a part or product. In addition to providing 3-D visualization for digitally rendered items, rapid prototyping can be used to test the efficiency of a part or product design before it is manufactured in larger quantities. Testing may have more to do with the shape or size of a design, rather than its strength or durability, because the prototype may not be made of the same material as the final product.



DESIGN CONCEPT EXPLORATION

Armed with a CAD file and the power of hybrid manufacturing, an engineer can experience and realize a new concept in his mind via making a prototype. Industries such as automobile and aerospace constantly seek upgraded physical structures or unique outer bodies of motorized vehicles in order to beat the laws of physics and deliver more economic results. The concepts can be tried out either via machining or 3D printing to give a quick idea of the shape and feel of the final product.



3D Printed Concept Airplane Models Used as Reference for Design Development

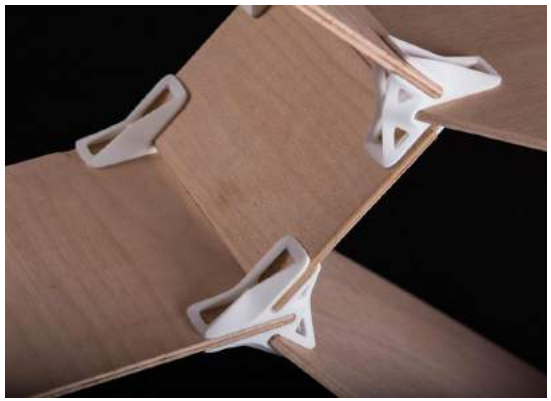
3D Printed Car Concept Model Printed in Parts and Assembled

3D Printed Bike Helmet and Bike Parts

DESIGN DEVELOPMENT - FURNITURE INDUSRTY

The furniture industry has always been a canvas for designers and artists. Unfortunately, until improvements in the manufacturing sector, designers were restricted by the abilities of a carpenter or unaffordable CNC machines. With the Halo, an artist can explore and engender elaborate, convoluted and labyrinthine designs. Knotty parts can be easily intertwined via a connector made via hybrid manufacturing.




3D Printed Parts for Joinery and Form Exploration

DESIGN DEVELOPMENT - JEWELLERY, FASHION ACCESSORIES AND FOOTWEAR

Industries such as jewelry, fashion accessories and footwear witness a tedious amount of ideation and prototyping before finalizing a product for the end user. Several ideas being tried out end up in creating the ideal product and are requisite for these industries. Utilizing hybrid manufacturing, one could create the outer frame of a contemporary spectacle design, a rippled sole or adorning coronets.

3D Printed Model of Pendant

3D Printed Spectacle Frames

Prototype of Bracelet

3D Printed Prototype of Necklace

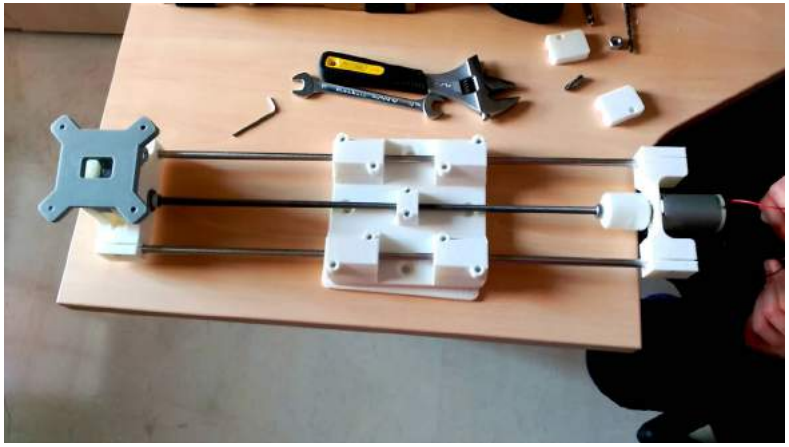
Prototype of Shoes

DESIGN DEVELOPMENT - PART DESIGN

User experience and functionality is critical for a new product being rolled into the market. The angle at which a user places his fingers on a gamepad or the force with which a liquid flows through an intricate channel can swerve final product design decisions. With the Halo, a user could create such parts and empower the designers with a proof of concept.

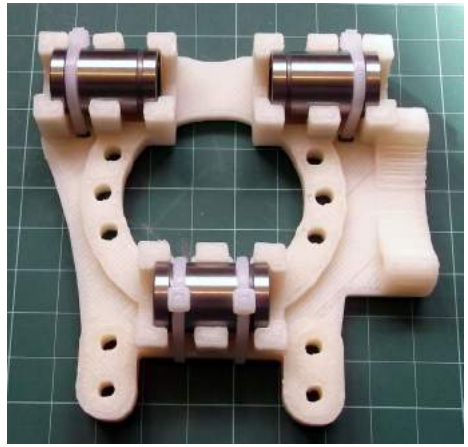
3D Printed Impeller Design

Casings for Gaming Consoles and Controllers



Rapid Prototyping of Linear Actuation Models

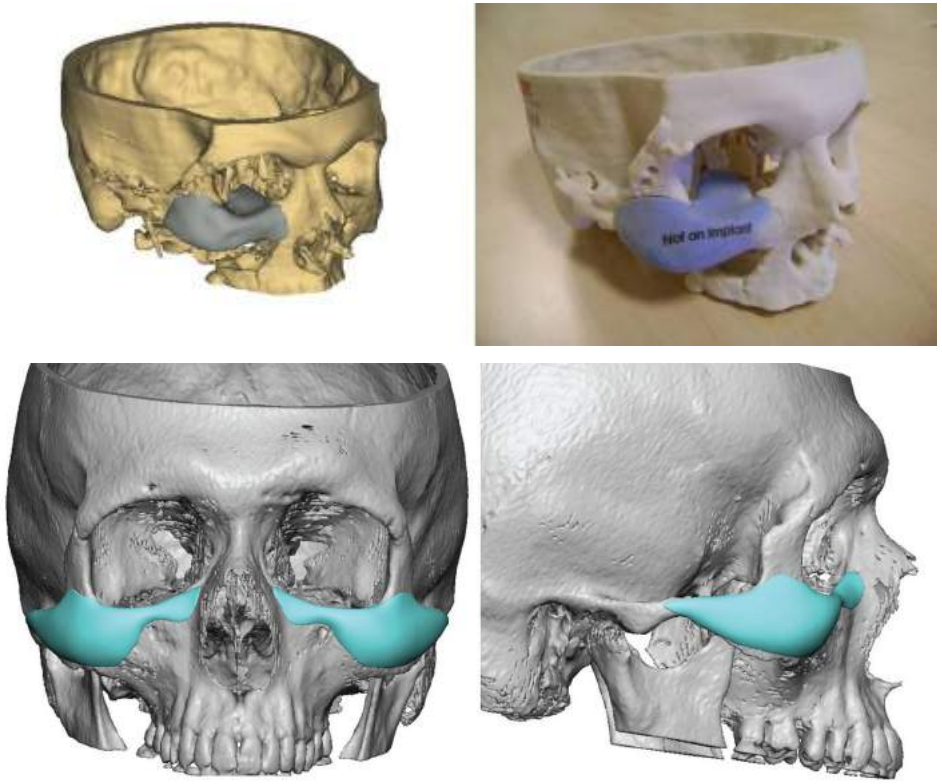
Parts for Large Prototypes



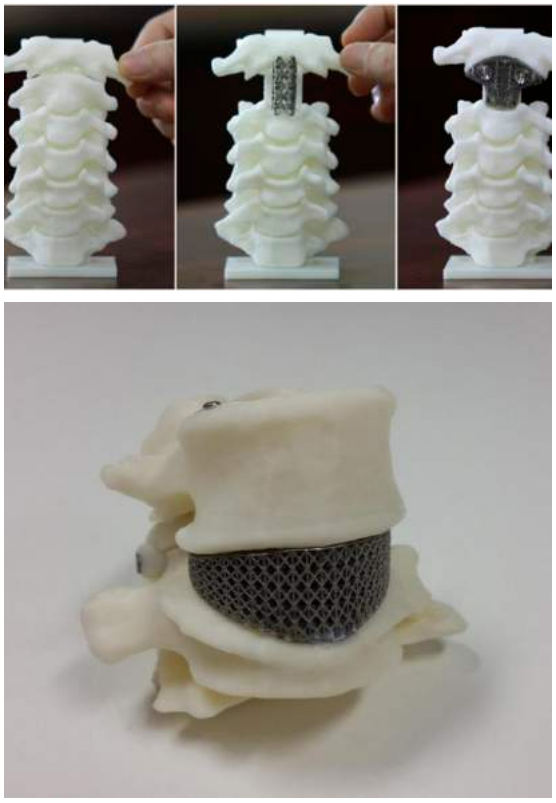
3D Part with Mechanical Fittings for Testing

DESIGN DEVELOPMENT - MEDICAL IMPLANTS

Hybrid manufacturing in the medical sector can open up a plenty of options for researchers and surgeons likewise. Being able to lay their hands on a part of a human/animal body before entering a surgery or while researching, will give the medical personnel a clear picture of the complexities involved in the entire process. Beyond that, being able to machine small complex anatomical parts such as parts of the cheekbone and cranium can help in reconstruction and the entire cosmetic industry.



3D Printed and CNC Milled Prototype for Malar Implants

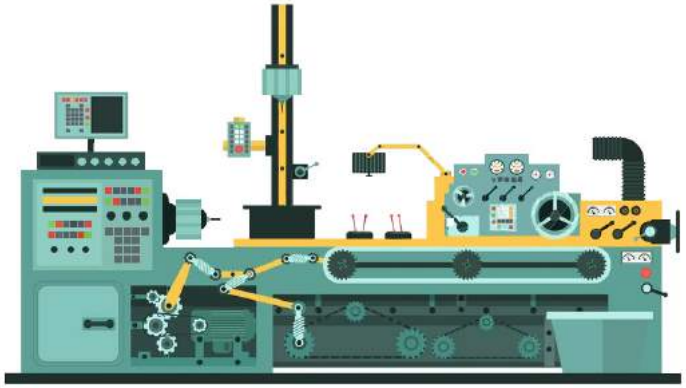


3D Printed Prototypes for Spinal Implants

3D Printed and CNC Milled Prototype for Cranial Implants

Recent advancements and developments in technology have empowered a machine manufacturer to produce machines that are lightweight and small but sturdy and reliable at the same time. The applicability of CNC and 3D printing in fabricating parts that have true utility value has been on the surge.

Hosts of equipment comprise of smaller parts that can be created with the aid of hybrid manufacturing. The Halo can be used to realize several parts that can be created out of milling and etching processes or parts those are 3D printed and finished with a milling end to provide the necessary aesthetics. These parts then go on to facilitate the functioning of a complex system. Hybrid manufacturing contributes in its own way to Direct Manufacturing by being able to create components that are durable, given the right selection of material and carefully crafted designs.



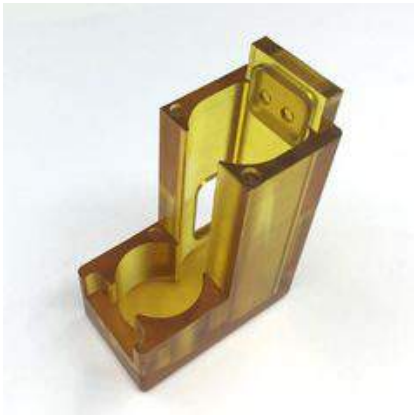
PLASTIC COMPONENTS

Plastic components are ubiquitous. They undergo lengthy processes to reach the final desired shape and fit. Several processes such as making of molds, injection molding and blow molding can be replaced with the aid of hybrid manufacturing. The Halo can machine several plastics such as Nylon, Delrin, PEEK, Ultem, Polyethylene, PMMA, Polycarbonate, etc., to desired levels of accuracy and create complex parts. The machined parts can then be used in larger systems that are both moving and stationary.

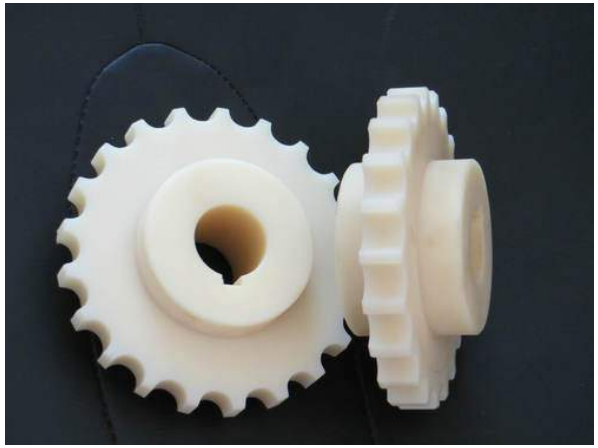
Nylon Machined Parts

Delrin Coupling Sleeve

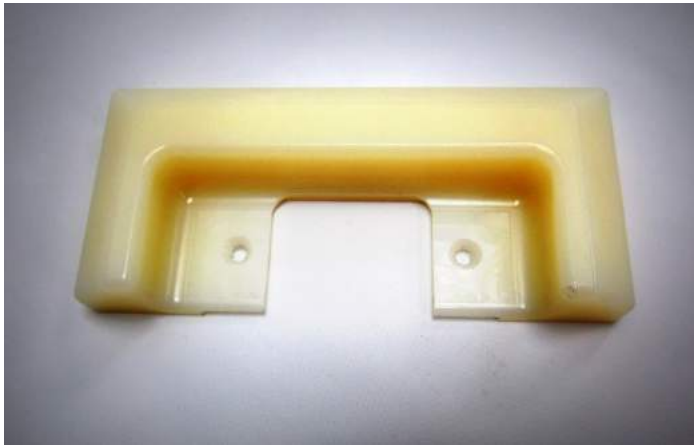
Nylon Machined Pulley Guide



Machined Ultem Housing



Heat Stabilized Nylon Gear

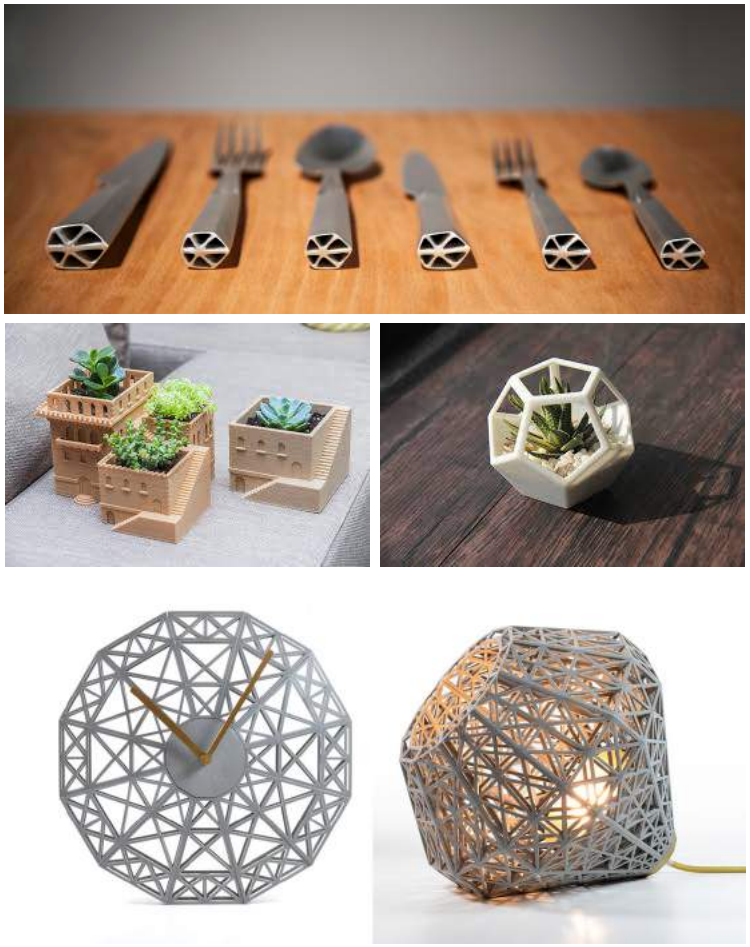


Polyethylene Machined Bracket

Machined PEEK Parts

DESIGNER PRODUCTS

The ability and vision of a designer is seldom met if traditional forms of manufacturing are followed. Even if that is met, the turn around time for design validation is significantly high. Products that are designed with keeping soft materials in mind such as wood, plastics, etc., can be machined on the Halo to desired levels of precision to create products that are good to go to the market. Several small businesses that create heritage products and custom showpieces are wary of sharing their designs due to the fear of their designs being copied. Being equipped with a hybrid manufacturing machine reduces their dependency on external vendors for their creative products.



3D Printed Designer Products

CNC Milled Designer Products

MUSICAL INSTRUMENT PARTS

Hybrid manufacturing can directly impact the lives of manufacturers of music instruments. Instruments such as flutes, guitars, ukuleles, etc have a slew of complex and tiny parts. Manufacturing such infinitesimal parts can be nerve wrecking. These parts are usually made from soft materials. The intricacy and final output depends on the complex bends, curves and gradients that are created on these parts in order to facilitate the right amount of airflow or vibrations. The Halo has the capability to print or machine out such components.

3D Printed Musical Instrument Parts

CNC Milled Musical Instrument Parts

FURNITURE PARTS

Several parts that can be machined out of wood and plastics can be directly implemented to play various roles in the furniture industry. Light-weight furniture also provides one with the options of creating parts out of soft materials. These parts either form a part of the main structure or act as joints to connect several parts of the structure. They also help in providing stability to the entire structure in certain cases.




3D Printed Furniture



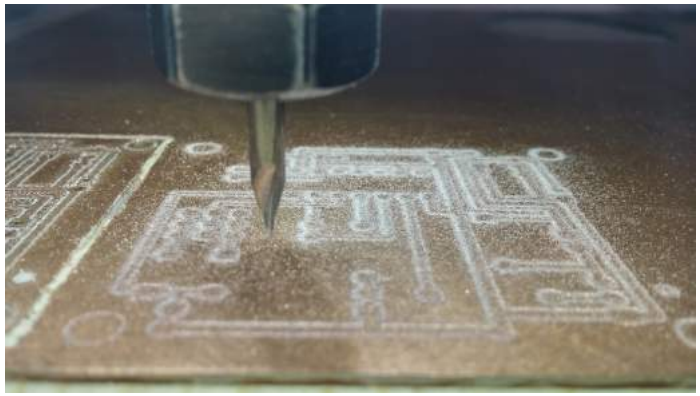
CNC Milled Furniture

PCB MILLING

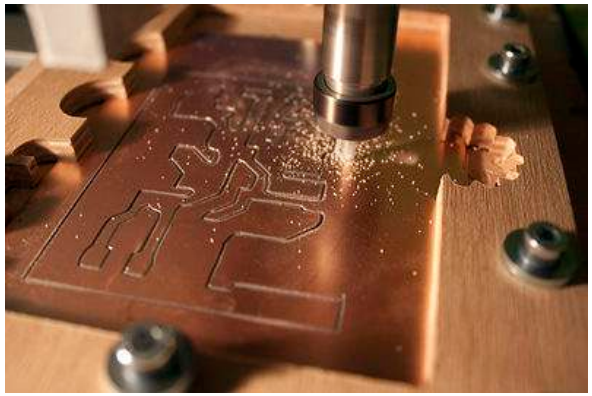
Printed circuit board milling is the process of removing areas of copper from a sheet of printed circuit board to recreate the pads, signal traces and structures according to patterns from a digital circuit board plan, known as a layout file. In the case of PCB milling, the quality of a circuit board is chiefly determined by the system's true, or weighted milling accuracy and control as well as the condition (sharpness, temper) of the milling bits and their respective feed/rotational speeds.

MANUFACTURING PROCESS:

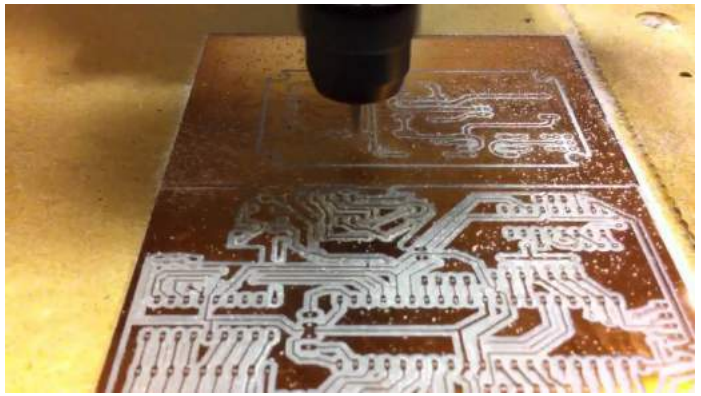
CAD: The first step of the workflow is CAD (Computer-Aided Design), in which the designer uses software to create the circuit schematic and board layout.
CAM: The second step in the workflow is CAM (Computer-Aided Manufacturing), in which the designer uses software to generate instructions for the CNC machine, based on the board layout.
MILL: The third step in the workflow is milling the board with a CNC machine using the instructions (G-code files) generated by the CAM software.



PCB Etching using CNC



PCB Milling using CNC

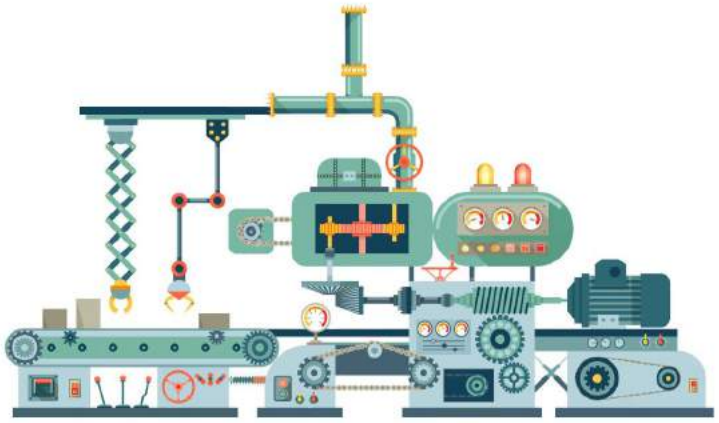


PCB Milling using CNC

AID IN MANUFACTURING PROCESS

Manufacturing in itself is a tedious process, which incorporates several tolerances and complex calculations. This is true across the entire spectrum of manufacturing and not just for large systems. Compact and large parts assimilate different challenges of their own via several processes before they see the light of the day.

Hybrid manufacturing can create components that aid in such convoluted manufacturing processes. Before the final product reaches the market, a manufacturer might have to create numerous molds or dies made out of a host of materials. Patterns that have the capability to produce final parts in bulk can be machined or 3D printed by the Halo. These patterns can also provide a manufacturer an idea of how the final product will be fashioned. This also eliminates the costs incurred in manufacturing expensive dies and moulds. The Halo helps extensively in aiding the manufacturing industry to solve its tortuous means and methods.



DIES AND MOULDS - PLASTIC MACHINED

Several plastic components are realized via the method of mould creation and injection molding. The initial step however, is to machine a mold before the final part can be produced in bulk. The Halo can be utilized to create dies to understand the complexities that will arise before the machining of the actual mould can begin. The necessary cuts, fluid flow, curvatures, slits, textures, gradients, holes, placement of grips can be realized via the Halo. These moulds can be realized via machining different kinds of plastics such as Nylon, Delrin, PEEK, Ultem, Polyethylene, PMMA, Polycarbonate, etc., in the Halo.

CNC Machined Plastic Mould for making a Strainer Cover

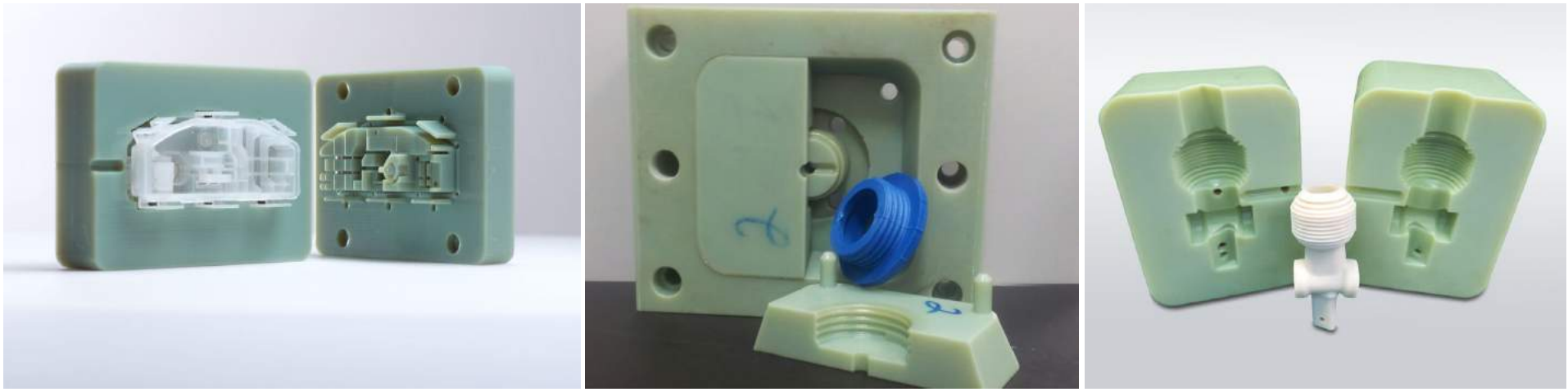
CNC Machined Plastic Mould for making a Soap Case

CNC Machined Plastic Mould for making Parts of a Mouse

CNC Machined Plastic Mould for making Parts of a TV Remote

DIES AND MOULDS - 3D PRINTED

Being a Hybrid Manufactuing Machine, the Halo is not only capable of making mould and dies by milling, but also via 3D Printing. 3D Printed dies and moulds can be easily manufactured on the Halo.



3D Printed Mould and Part with Intricate Details

3D Printed Mould for Soap Case

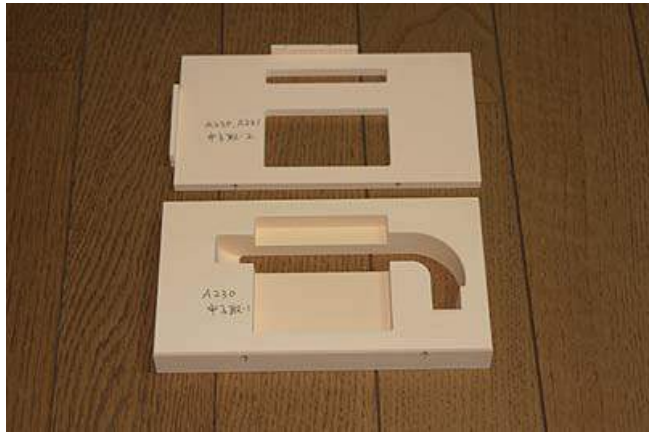
3D Printed Mould and Soap Case made from the Mould

3D Printed Mould for Decorative Parts

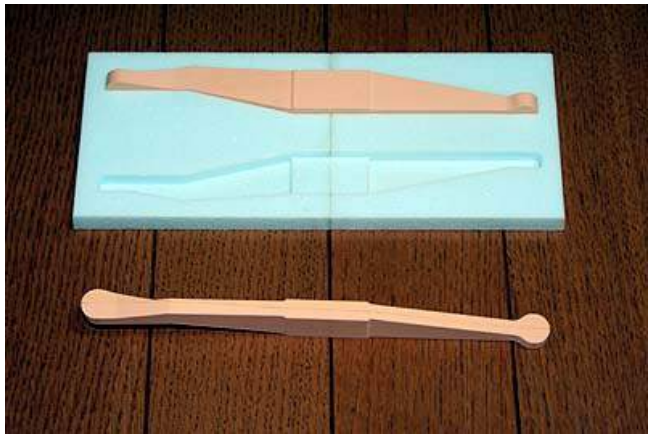
PATTERNS FOR CASTING - WOOD

Wooden patterns are used for a variety of applications. The pattern created is utilized to fabricate the final mould. These patterns are created repetitively as wooden patterns are consumed to create the mould. They are used for short production runs and are highly cost effective. With a 5-axis machining capability, the Halo provides a manufacturer the capability to machine such patterns and utilize it in the production chain.

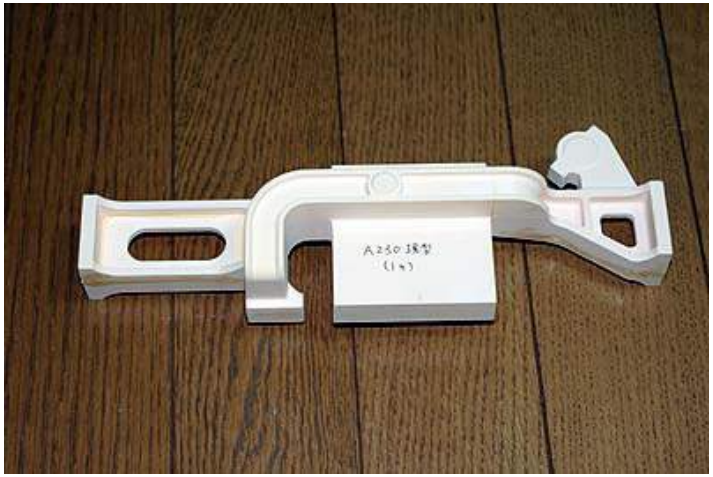
Pattern For Parts Milled on Wood By CNC



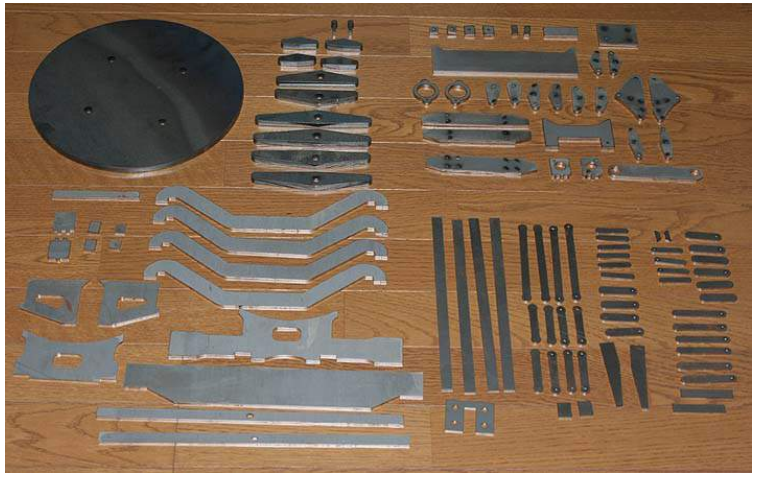
Final Wooden Pattern Showing Details



Silicon Mould made from the Wooden Pattern



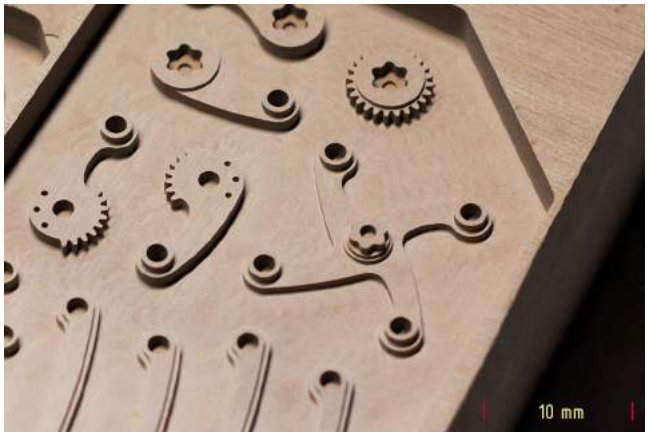
Test Part made using the Mould



Final Parts in Aluminum made using the Mould

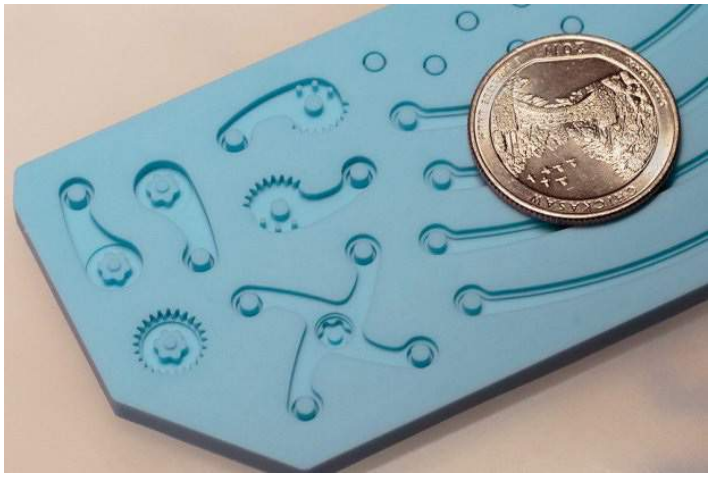
PATTERNS FOR CASTING - WOOD

Pattern For Gears And Other Parts Being Milled On Wood By CNC



Final Wooden Pattern Showing Intricate Parts

Silicon being poured into the Pattern to make the Mould



Final Silicon Mould made from the CNC Wooden Pattern

Final Parts made by pouring Epoxy Resin into the Mould

PATTERNS FOR CASTING - 3D PRINTED

Being a Hybrid Manufacturing Machine, the Halo is not only capable of making patterns by milling, but also via 3D Printing. 3D Printed patterns, made on the Halo can be used to manufacure dies and moulds very easily. This method also allows for making patterns which are not possible by machining and serves as an ideal method for small scale manufacturing.

3D Printed Master Pattern, Plasticine Moulds and Final Part

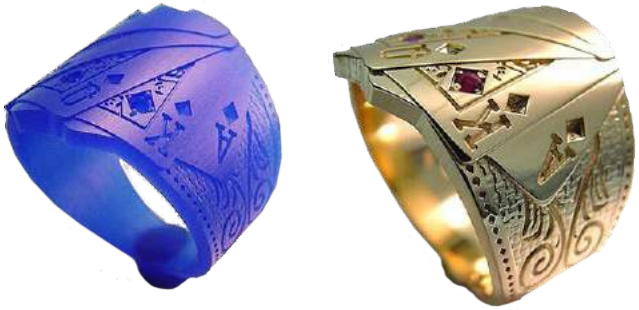
3D Printed Master Pattern for Mould Making

Sand Casting Mould Made from 3D Printed Master Pattern

3D Printed Master Pattern and Final Product after Casting

PATTERNS FOR CASTING - WAX

A common technique in jewelry making and manufacturing is lost-wax casting or investment casting. Usually, a model or “pattern” is made in wax, then a plaster mold is made around the wax model. When the mold is fired in a kiln, the wax is burnt out or “lost”; then the metal parts can be cast in the mold.



CNC Milled Wax Pattern and Finished Ring in Gold

CNC Milled Wax Pattern of Wedding Ring and Finished Ring in Platinum

CNC Milled Wax Pattern of a Pendant

Finished Pendant in Gold made by Investment Casting

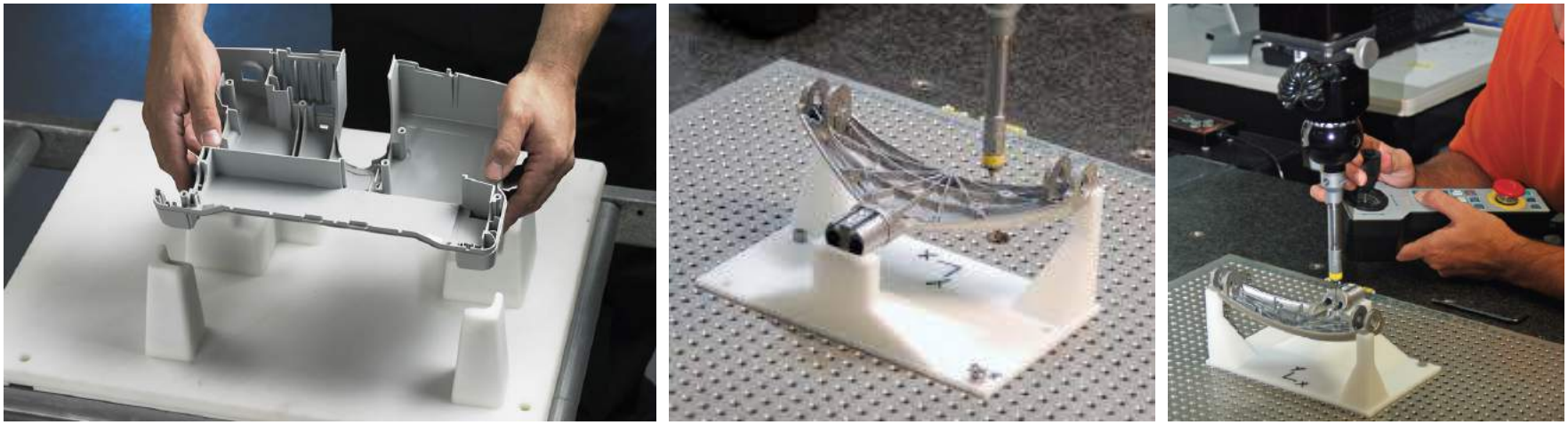
SUPPLIMENT IN MANUFACTURING PROCESS

Apart from the numerous procedures concerned with manufacturing processes, to realize one's designs and concepts, several supplements such as tools, jigs, fixtures, measuring tools etc. are necessary. These supplements however do not have a direct role to play in the manufacturing of the final piece but are primitive requirements and have a tangible impact on the part produced finally.

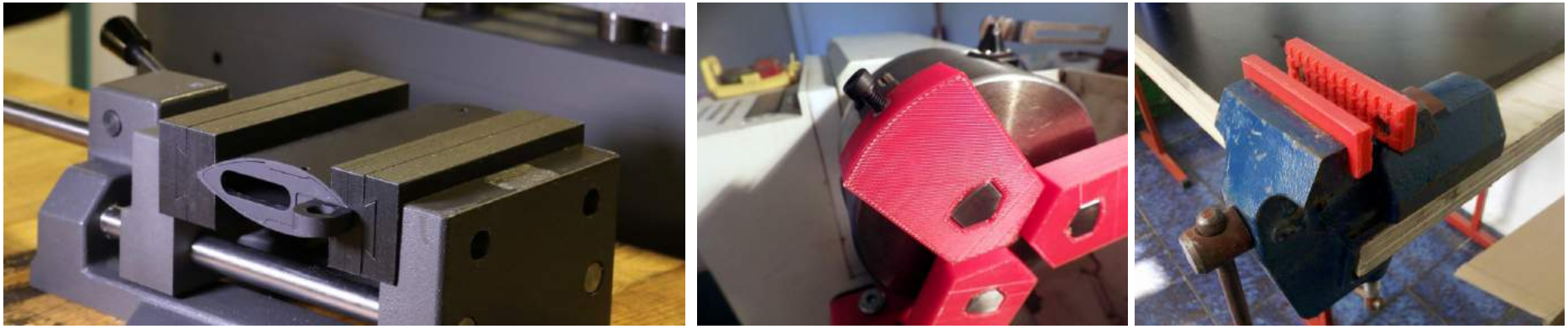
Supplements vary case-to-case basis depending on the geometry and complexity of the work piece. The structure, shape, form and strength of supplements vary accordingly as well. It is imperative that the manufacturing costs be reduced by incorporating the aspects of such supplements as well. With the assistance of hybrid manufacturing, such supplements can be produced quicker and more efficiently.

JIGS AND FIXTURES

The industry manufactures jigs and fixtures and offsets the cost of the same by adding to the price of the final product. Given the complex shapes of the jigs and fixtures, producing these supplements is a costly affair. The Halo can be utilized to create custom jigs and fixtures for individual scenarios. Employing hybrid manufacturing can reduce the downtime in producing these jigs and fixtures either by machining them or 3D printing them.



3D Printed CMM Jigs and Fixtures

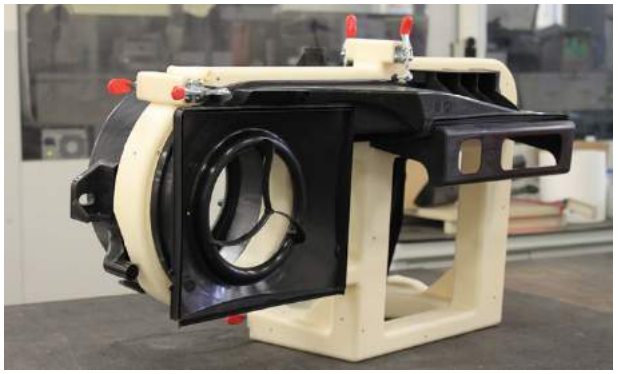


3D Printed Soft Jaws as End Effectors and Vice Grips

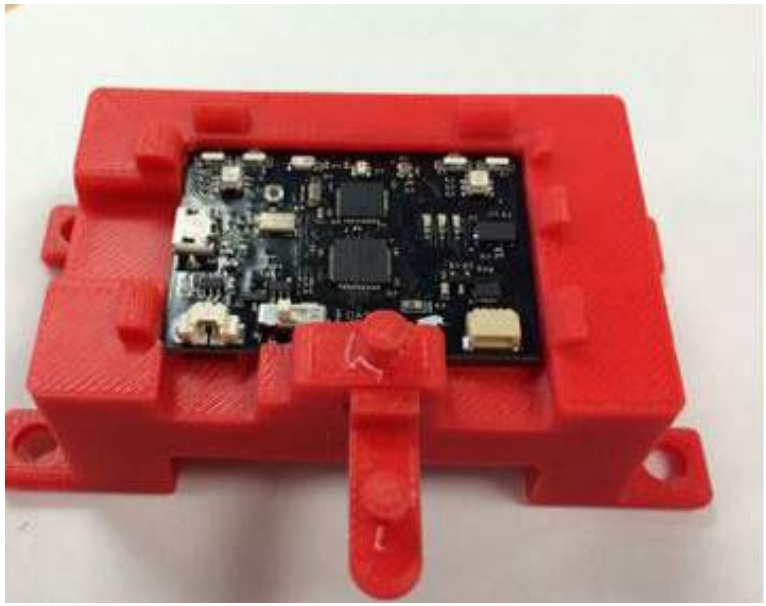
JIGS AND FIXTURES

3D Printed Jigs for holding the two parts of a Mould in Place

3D Printed Jigs for Holding Products in Assembly Lines



3D Printed Jigs for Parts together for Welding or Screwing Purpose



3D Printed Jigs for Holding Electronic Circuits for Soldering

3D Printed Jigs for Housing Electronic Instruments for Ease of Use

3D Printed Jigs for Housing Electronic Assemblies for Testing