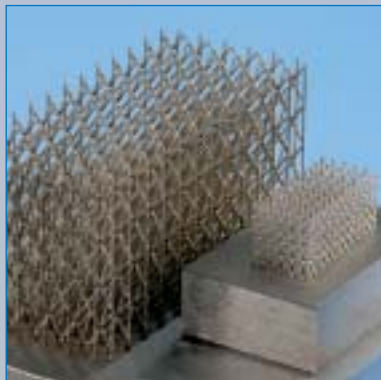


# MCP RAPID TOOLING TECHNOLOGIES

RAPID TOOLING  
RAPID REALISATION  
RAPID MANUFACTURING  
RAPID PROTOTYPING



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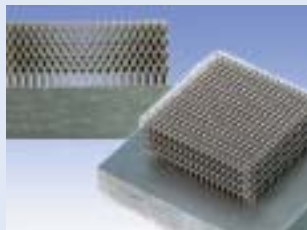


## A new world-class generative process developed for direct product realisation with **Selective Laser Melting**.

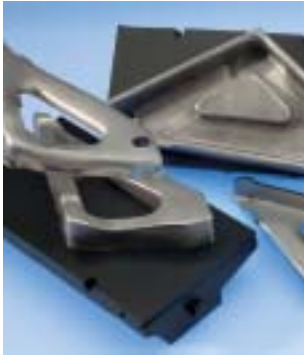
Applications include sheet metal press tools, pressure die casting tools, injection moulds and finite metal. Even high quality metal parts such as components for medical implants can be produced to exact details.

### The advantages of the MCP Realizer II<sup>SLM</sup>:

- Builds high quality parts and tooling inserts from almost any type of metal: Stainless steel (tool steel), titanium, cobalt-chrome and various nonferrous-metals.
- Special designed HQ-Powders.
- Dense and homogeneous build up of components and tool cavities up to 100% depending on requirements.
- Fast and low cost because no post processing required such as like heat treatment or infiltration.
- Same day process, produce the component (insert, press or mould parts) literally within hours. Fully automatic building process – parts overnight.
- Produces tools and inserts with internal undercuts and channels for conformal cooling.
- High resolution, dimensional accuracy, no distortion.
- Quick building process – 7.000 mm<sup>3</sup> dense steel per hour on average.



## SLM Examples



Tooling made from stainless steel (316 L) for heavy gauge sheet metal formings. 3000 parts with 3 mm thickness without visible wear.



Individually generated medical implants, dental bridges and crowns. Material: Cobalt chrome and stainless steel (316 L) with material properties better and more durable than castings.



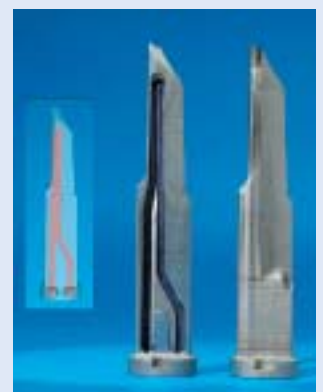
Light weight construction, hollow core, wall thickness 2 mm, with inner supports. Material: Titanium (TiAl6V4) and stainless steel (316 L). These applications and prospects are seen in the areas of medical implants, aircraft and automotive industry.



Injection mould insert in dense stainless steel (316 L). The built-in conformal cooling channels reduce cycle times.



SLM (Selective Laser Melting) is a registered Trademark of F & S GmbH.



## Worldwide, the most widely used system for prototype part manufacture – The MCP Vacuum Casting System

A full package turnkey system, first introduced in 1987 for producing exact and complicated prototype components in vacuum plastic, nylon and wax materials. A package system generally includes a combination of vacuum casting machines and ovens of the size required, tooling materials – usually silicone rubber – and a range of over 30 MCP Vacuum Plastics (comparable in performance to thermoplastics), and, important accessories. A full course of training, in-house at the customer's premises, worldwide is always included.

With this process, multi segment molds can be made overnight to be cut open the next day ready for casting the first prototypes on the vacuum casting equipment. Using the MCP Vacuum Casting Technique 30 to 50 color matched functional prototypes can be produced within two to three days from any type of model. MCP Vacuum casting is now becoming the state-of-the-art technology for achieving technical prototypes for exhibition and functional testing and mold design checks. On average, users can expect to save 97% in time and cost compared to conventional steel tooling.

### Widest range of materials

MCP is the largest supplier with the most comprehensive and best performing range of vacuum casting materials and silicone rubber tooling materials worldwide.



Multi colour prototypes. Produced with the MCP Vacuum Casting System.

### Completely Different Applications for MCP Vacuum Casting Machines

**VarioPressure Casting.** Parts from highly viscous materials (Silicone).



**Wax castings for metal investment casting.**



**Fusible Core Technology:** internally undercut plastic castings.



**EP Tooling Resin** processed on MCP Vacuum Machines.





## MCP Nylon Vacuum Casting

A completely new Rapid Prototyping, Rapid Manufacturing Process for prototype and production parts in Nylon PA-6. This new technology has all the advantages of the MCP standard Vacuum Casting Process.

- Quick, accurate, multi-segment silicone mold making within 12 hours
- Use any type of model
- Demold in only 6 minutes after casting
- Extremely thick and thin walled parts
- MCP PA 2000, PA 1000 and PA 700 have all the properties of injection molded nylon polymers (see comparative data below)
- MCP Nylon Castings are air, gas and water tight
- Can be welded and glued
- Chemically resistant
- Can replace metal components

Some applications: automotive inlet manifolds, engine compartment parts, lamp housings.

MCP Vacuum Cast Parts can also be used for clips, living hinges, containers, 2 part inlet manifold shells, air filter housings, radiator water tanks and gears.

- 1 MCP NYLON PA 2000
- 2 MCP NYLON PA 1000
- 3 MCP NYLON PA 700

		MCP®		MCP®			MCP®			Test
	Unit	PA 12	NYLON PA 2000	PP	NYLON PA 1000	ZYTEL®	NYLON PA 700	PE HD	PE LD	ISO / DIN
Flexural Modulus	Mpa	--	1950	950	862	750	--	--	178	--
Tensile Modulus	Mpa	1000 - 2000	1800	1300	850	900	650	700 - 1400	200 - 500	R 527
Tensile Strength	Mpa	52 - 60	60	15 - 37	42	41	32	18 - 35	18 - 35	R 527
Heat Deflection Temp. (HDT) 1,8 Mpa	°C	42 - 80	105	45	51	71	49	50	50 - 35	75 (A)
Heat Deflection Temp. (HDT) 0,45 Mpa	°C	--	195	120	131	140+	76	50	50 - 35	75 (B)

Comparative data: Injection moulded DuPont™ Zytel® ST801 Polyamide 66, conditioned.

Data after conditioning



The MCP 4/04 Nylon Module Version Machine. Easy to use controls to guarantee best casting results.



Load the silicone mold. Standard silicone mold technology is used for this process.



Close the doors and let the PLC controller take over.



## Rapid Metal prototyping and manufacturing – The finest in Investment Casting Technology The MCP Metal Part Casting Process



### Pressure Die Casting Quality Guaranteed!

The MCP Metal Part Casting Process has been designed specifically to meet the increasing demand for quick, economical metal castings for prototypes, low and medium runs of several hundred parts.

A new and complete package process for producing quick metal prototypes and mold inserts in as little as one day in materials such as zinc, aluminium, bronze, brass and copper when using "burn out" models in wax, polystyrene (SLS) or Quick Cast or, three days when using other types of model. From which molds for casting waxes need to be made.

To apply the new process, wax castings or meltable models are required, which are encapsulated in ceramic and heated and melted out to leave a cavity which is filled with metal either under vacuum, pressure or gravity using the MCP Metal Part Casting Equipment.

The automated Metal Part Casting Equipment is suitable for a clean laboratory type environment not usually associated with a foundry applications.

### Further important advantages of the process:

#### Use Any Rapid Prototyping Model

Start the process with any type of master model such as SLA, QuickCast, Objet, ThermoJet, Viper, LOM, SLS, FDM etc. and in any complexity.

#### Combined Technologies

#### Low Cost Tooling

Utilise the **MCP Silicone Tooling Method** to produce quick, low cost, multi segment moulds for wax part production, impossible with standard, traditional tooling methods.

#### Produce Precision Wax Models

Use the well established method of master model duplication, the **MCP Vacuum Casting Process**, to produce thin walled, undercut wax models using silicone tooling.

#### User Friendly, Clean

The automated Metal Part Casting Equipment, can be used in a clean laboratory type environment not usually associated with a foundry applications.

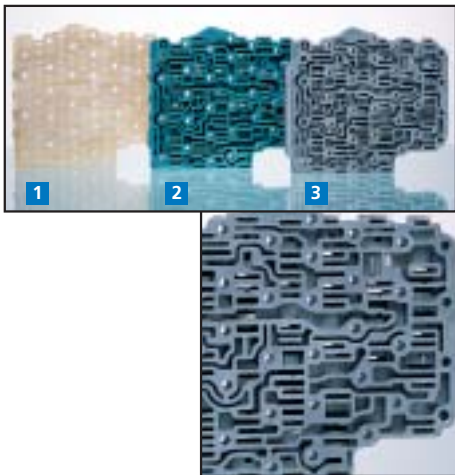
#### No heat radiation –

#### No dirt –

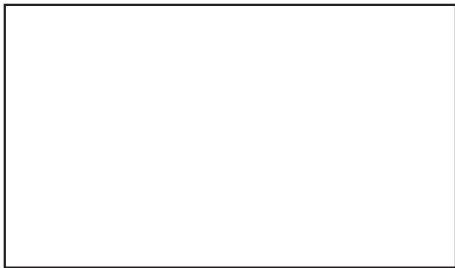
#### No fumes.

- 1 Set up the wax models adding the gate & some risers.
- 2 Place the casting flask over the wax models.
- 3 Mix and cast ceramic under vacuum to encapsulate the wax models in the flask. Place in the oven.
- 4 Remove the flask from the oven and place into the casting unit and close.
- 5 The PLC touch screen controller will operate all important parameters of the casting process. Melting takes between 15 and 20 minutes depending on the type and amount of metals. The casting operation is performed automatically in just a few seconds giving perfect results. No heat radiation, no dirt, no fumes.
- 6 The metal part can be removed from the ceramic mold within 30 – 60 minutes after casting.

# Metal Part Casting Examples



- 1 The Rapid Prototyping Model (RP).
- 2 The wax model produced with the MCP Vacuum Casting Technology.
- 3 The resulting complex aluminium component, an automotive gearbox duct plate with more than 80 measuring points, made with the MCP Metal Part Casting Process. 380 parts already produced for prototypes and pre-series requirements.



Machine type	Casting volume of metal	Flask size
MPA 300	3,0 litres (8 kg Aluminium)	Ø 350 x 500 mm
MPA 1000	10,0 litres (28 kg Aluminium)	Ø 550 x 700 mm
MPA 1500R	15,0 litres	

Some data (extract) on Metal Part Casting Units



3 days to complex metal parts  
 - left, the model and the multi-segment silicone mold  
 - the highly accurate wax casting through MCP Vacuum Casting  
 - right, the resulting casting through MCP Metal Part Casting in die casting quality



One day from the model to the metal casting.  
 SLS Polystyrene "burn out" model and the resulting Metal Part Casting in aluminium.



**Left:** The Rapid Prototyping Model.  
**Center:** The wax model produced with the MCP Vacuum Casting Technology.  
**Right:** The resulting complex aluminium component made with the MCP Metal Part Casting Process.



## Product design and low series production – The MCP Injection Moulding Machines for prototypes and short run plastic parts

The quick and economic way of making plastic components „in house“

MCP semi-automatic machines are capable of a long or a short production runs and are particularly suitable for insert moulding. The machines have a power lock and a dwell timer, enabling a pre-set ram pressure to develop a single, timed injection stroke at the push of a button. Alternatively, MCP machines provide the option of manual operation, a particularly useful feature for setting up moulds. The mould is readily accessible to the operator making mould changes and modifications quick and convenient.

Specification:

### **MCP 100 KSA Injection Molder**

Locking pressure	20 t
Standard diameter*	35 mm
Injection pressure	410 bar
Shot weight	100 g
Heating capacity	1.8 kW @ 220V/110V
Plasticising capacity	7 kg/h
Electric supply	2 kW @ 220V/110V 50 or 60 cycles
Air supply	Approx 8 bar
Maximum tool size**	150 x 150 x 250 mm H x W x D
Machine size	1280 x 760 x 400 mm H x W x D
Machine weight	260 kg

\* Optional injection units are available

\*\* By removing the end stop, molds longer than 250 mm can be used

### Fields of Application

- Production machine for prototype and small batch production from 10 to 1000 parts
- Production machine for insert moulding
- Laboratory machine for testing plastics and moulds
- Machine for schools and training establishments
- Injection moulding of wax models for investment casting

### Advantages of the MCP Machines

- Low cost
- Robust design
- Simple Installation
- No servicing
- Low space requirement
- Simple low cost moulds
- Easy mould access
- Quick and easy mould and material change
- Relative to injection capacity MCP Machines are the most compact and easy to use on the market

### Further Advantages of MCP- Injection Moulding Machines

- Moulds almost any thermoplastic materials
- Quick material changes use low cost „bridge tooling“ systems such as metal spray moulds, aluminium or EP 310
- Quick installation – easy to use
- Moulds set-up within minutes
- Permanent access to mould – manual demoulding saves costly ejector systems
- High shot capacity – low investment

## Quality injection tools in just a few days – MCP EP Tooling Resins

### The path to product success

Shortened product cycles require new and better methods for realising production tooling. Injection molding is internationally the most used plastics processing method but conventional tooling for this process is expensive and time consuming to produce. New methods of Rapid Tooling such as EP tooling resins show that it can be achieved quicker and at a lower cost. Decisive is a material which is easy to use and which will produce tooling to fulfil all the requirements of injection molding. Further, the material needs to have similar stability to aluminium with a high surface quality. With EP tooling resins, MCP-HEK has developed a material which fulfils all the requirements completely. Molds produced in EP 250 show an extremely high glass transition temperature and compressive strength. Shrinkage is negligible at approximately + 0.02 percent. Despite the high aluminium filler content of 80 percent, EP tooling resin demonstrates excellent casting properties with high surface finish reproduction from any type of model.

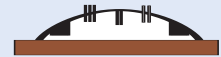
Chemical resistivity is above average and the high quality dense surface can be polished to a mirror like finish if required. For mold changes and alterations, EP tooling resin molds can be reworked easily without losing mold stability and strength. EP tooling resin tooling resin makes possible the manufacture of quick, economically acceptable injection molds and quality parts.

### Processing EP Tooling Resin

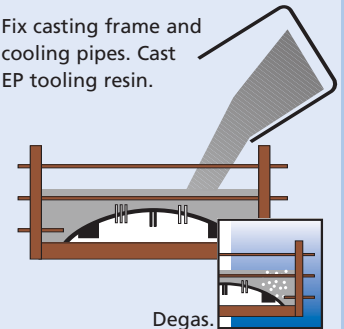
#### Day One

Use models in any materials: wood, plaster, leather, silicone, resin or any type of rapid prototyping model.

Fit metal inserts if required.



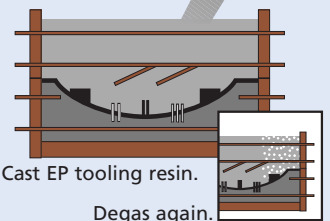
Fix casting frame and cooling pipes. Cast EP tooling resin.



Degas.

#### Day Two

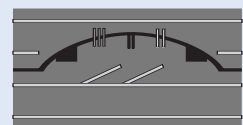
Fix upper casting frame.



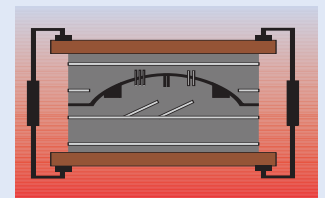
Cast EP tooling resin.

Degas again.

#### Day Three



Remove the casting frame.



Heat cure the mold in the oven.



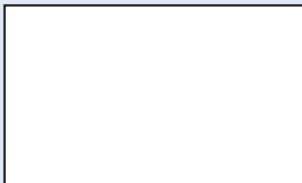
Completed injection tool.



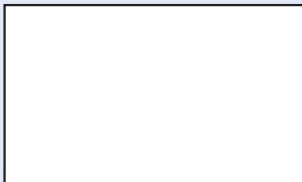
Prepare a model of any material ie: wood, tooling board, styrofoam or SLA (Stereolithography)



To produce the punch, fill the casting pattern with MCP Alloy using a pre-prepared sheet metal retainer frame.



Punch and blankholder finished.



Assembled punch and blankholder.



Coat with wax sheet in the thickness of the sheet metal to be used and cast the MCP Alloy to produce the bottom die.



The finished component, manufactured in a MCP Sheet Metal Forming Die.

## Prototype sheet metal forming tooling using MCP Low Melting Print Alloys

### In as little as 2 days

Sheet metal forming tooling produced with MCP 137 Low melting point alloy is used by many European automotive manufacturers, such as BMW and Daimler Chrysler. These automakers use this process prototype runs of 100 – 200 pressings. This technology offers a multitude of tool making options for the user:

### Easy to use, clean process

The most straight forward procedure is to use an existing sheet metal component (with the required modifications), suspend this in a casting frame and cast the alloy to produce the top and bottom tool simultaneously. Generally, the standard method of tool manufacture is to produce a model of either one or other side of the component required. The Low melt alloy is cast against this model to produce the first half of the tool. Demolded the model after cooling and lay up the casting with pattern maker's sheet wax in the required thickness of sheet metal required, for example 0.8 mm and cast low melt alloy against the wax sheet. Within a matter of hours after casting, the tool can be on the press to produce prototypes and small runs in materials up to 3 – 4 mm. The process offers options of integrating steel inserts and die plates for extending tool life up to 2 – 3000 parts and casting tools with blank holders for deep drawing applications.

### System Specification:

MCP 137 Low melting point alloy and melting equipment are the basic requirements to produce tooling. Melting tanks are supplied in sizes ranging from 150 kg (approx 330 lbs) melting capacity and up to 60 metric tons alloy capacity for producing automotive floor pan press tools. The alloy is completely re-usable.



## Other Applications of MCP Low Melting Print Alloys

Make the Impossible: five cylinder inlet manifold in 35% glass filled nylon.

**Left:** The metal core in MCP Low Melt Alloy. **Center:** The metal core, overmolded in plastic. **Right:** The finished component, after core melt out, internally undercut, impossible to produce with conventional tooling methods.



A transparent, internally undercut, one piece MCP Vacuum Casting in SG 95.



**Workholding of optical lenses (lens blocking).** Worldwide the standard technology for holding optical lenses in glass or plastic during grinding operations.



**Tube and profile bending.** Allows wrinkle free bending of the thinnest of wall thickness. Also for producing "T" pieces and complicated profiles. Use alloys from 70°C – 124°C melting temperature.



**Workholding of turbines blades.** Worldwide the standard technology for holding aircraft and steam turbine blades using alloys from 70C – 137°C melting temperature.



Melting tanks for casting and re-melting MCP alloys. Melting tanks are available in many size.





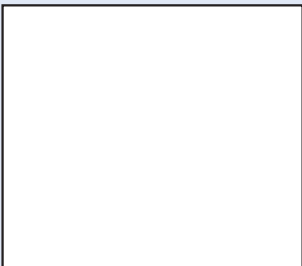
Service and training manuals, technical Videos and CD-ROMs.



Individual training.



Practical interactive training.



Rapid Tooling and Rapid Manufacturing Seminars.

## About MCP

From MCP's earliest days as a Bismuth specialist a global approach to distribution and marketing has been called for. An international presence is important too for raw material purchasing and trade in scrap and residues. Our local companies and agents have become a key factor in our determination to provide un-equalled customer service.

An important task for MCP is to develop further our markets in Eastern Europe and in Asia.

Demonstration Centres are important too as a method of ensuring effective communication with customers. Trained application engineers, operating in purpose-built centres, are best able to deal with client queries and advise on the latest techniques and materials.

Customer liaison and co-operative ventures are vital but we also have extensive dialogue with Universities and Institutes so that our concepts are always "out in front". Increasingly efficient use of scarce resources will always require a radical approach.

The Group's Central Laboratories have recently been expanded and re-equipped. They are now housed in a state-of-art facility on the Wellingborough site and provide an unrivalled service to all MCP companies. Quality Control must surely be at the heart of every successful business: MCP's laboratory for optimum control is a fine example of this philosophy.

The MCP Group Internet site is a popular point of reference for those interested in Minor Metals, Low Melting Point Alloys, Bismuth Chemicals, Rapid Prototyping or other MCP products and services. All are welcome to seek technical or commercial information and can do so quickly and economically round the clock using the e-mail links provided. MCP Internet and e-mail addresses are listed in full at the end of the brochure.

## MCP's Worldwide Success

Comprehensive, individual customer training has been a major contributor to the tremendous worldwide success of MCP Vacuum Casting processes. A further important factor is the total package supply concept which includes machines and equipment, tooling materials, casting materials, accessories training and service – all from MCP. One supplier: complete responsibility for customer satisfaction!

**Complete equipment • materials • customer training  
based on DIN ISO 9001 – worldwide**

## MCP RAPID TOOLING PROCESS TECHNOLOGY FROM A-Z

Over a period of 45 years the MCP Group of companies has grown to become a leading innovator with a worldwide reputation for supplying, installing and training in advanced mould technologies.

### HEK GmbH

Kaninchenborn 24-28  
D-23560 Lübeck · Germany  
Tel. +49 (0) 451 5 30 04-0  
Fax +49 (0) 451 5 30 04-50  
E-Mail: info@mcp-group.de

### EURO TECH CENTER

Kaarst/Düsseldorf  
Novesiastrasse 31  
D-41564 Kaarst · Germany  
Tel. +49 (0) 2131 5 10 56-0  
Fax +49 (0) 2131 5 10 56-32  
E-Mail: etc@mcp-group.de

<http://www.mcp-group.de>



MCP equipment and materials are exclusively distributed throughout Eastern Europe, Middle East, India, Pakistan, Far East, Australasia, S. America and S. Africa.

### MCP Tooling Technologies Ltd.

Whitebridge Way · Whitebridge Ind. Park  
Stone · Staffordshire · ST15 8LQ · England  
Tel. +44 (0) 1785 81 56 51  
Fax +44 (0) 1785 81 21 15  
E-Mail: equipment@mcp-group.co.uk

### MCP France S.A.

70, Rue Amelot · F-75011 Paris · France  
Tel. +33 (0) 1 47 00 88 09  
Fax +33 (0) 1 47 00 37 95  
E-Mail: mail@mcp-france.com

### MCP Italia Srl.

Via Lomellina 12/b rosso  
I-200 90 Buccinasco (MI) · Italy  
Tel. +39 (0) 02 488 52 11  
Fax +39 (0) 02 488 43 400  
E-Mail: sales@mcp-italia.com

### MCP Iberia S.A.

C/Ingeniero Fernandez Casado, 5  
E-288 20 Coslada (Madrid) · Espana  
Tel. +34 (0) 91 - 669 41 82/669 4236  
Fax +34 (0) 91 - 669 40 24  
E-Mail: mcpiberia@ctv.es

### MCP Technology

73, Y.Kolas str.  
220113, Minsk · Republic of Belarus  
Tel. +375 17 2625590, 2625612  
Fax +375 17 2620441  
E-Mail: mcptechnology@mcp.by

### MCP Systems Inc.

511 Commerce Drive  
Fairfield, Connecticut 06432 · USA  
Tel. +1 (0) 203 367 7761  
Fax +1 (0) 203 368 4787  
E-Mail: sales@mcpsystems.com



EURO TECH CENTER, Kaarst · Germany



MCP's 2.000 m<sup>2</sup> purpose built manufacturing and demonstration facility in Stone, Staffordshire · England

