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## UniMetal Surface Finishing

Thomaston, CT

This is the second in a series of feature articles for UniMetal. Besides telling readers about UniMetal, it also UniMetal, created to help Procurement Specialists better understand the plating processes. Using UniMetal's story helps to further explain what each process they offer does:

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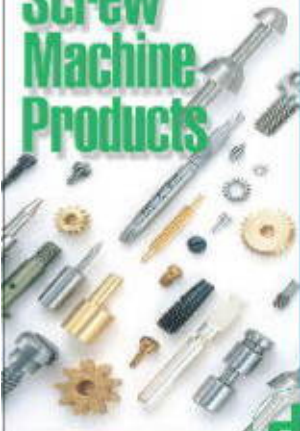
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# UNIMETAL SURFACE FINISHING, LLC

Thomaston, CT

**READERS:** This is the second installment of a Spotlight Feature Story featuring UniMetal Surface Finishing, LLC, with an educational slant to help procurement readers and job shop owners gain an overview of metal finishing. This second installment will cover some of the processes offered by UniMetal. If you need to review the first installment, we can send you an e-version of the first installment. Contact us at gatewaybill@yahoo.com

There are two types of plating processes. One is Electroplating using a direct electric connection to each part being plated.

The second method is Mechanical or Electroless Plating which as the name implies does not use electricity to cause the plating to take place. We'll look at each method so you can see the advantages.

## THE ELECTROPLATING PROCESS

Electroplating, also known as Electrodeposition, is essentially the process of producing a coating, usually a metallic layer, onto an electrically conductive substrate. This process is performed using an aqueous metallic salt solution called "electrochemical cell", which contains dissolved metal and other additives. Electroplating can use a large selection of metals including brass, bronze, cadmium, copper, chromium, gold, nickel, platinum, silver, tin, zinc and others.

## Step by Step Sequence Used in Typical Electroplating Process

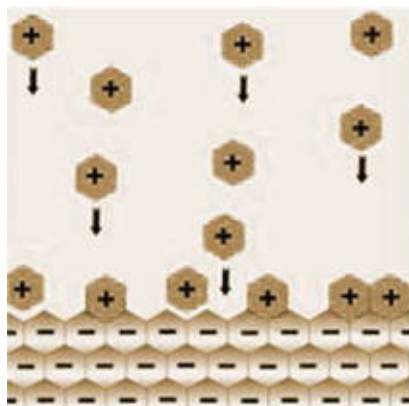
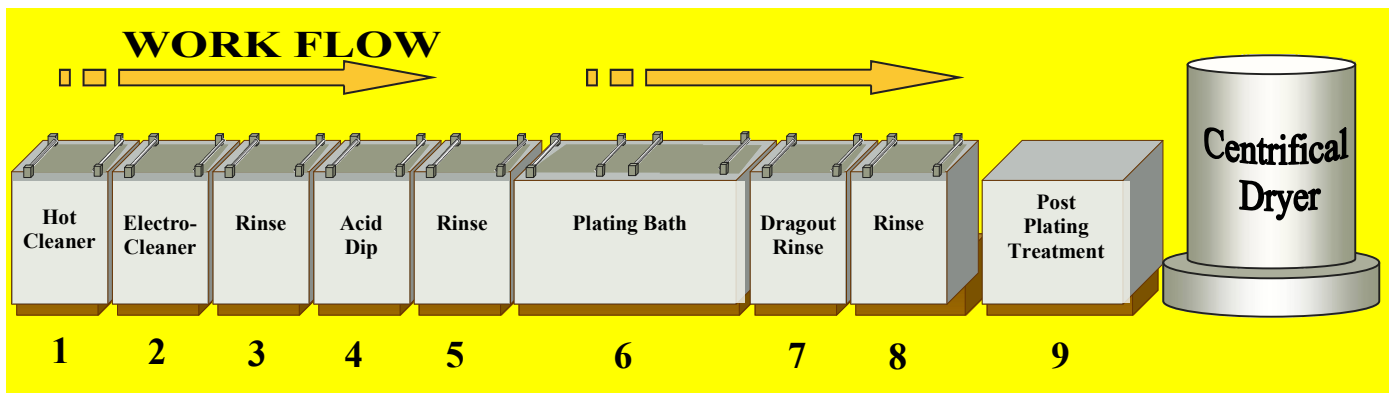
**Cleaning Process (Steps 1, 2, 4):** used to remove Soil from the surface of the parts (lubricants, cutting oil, wax, rust preventive, organic or inorganic film). Organic and nonmetallic films prevent perfect bonding due to poor adhesion between metal layer and substrate.

**Rinse (Steps 3, 5, 8):** water rinse to prevent cross-contamination between tanks and carry over.

**Plating (Step 6):** see electroplating process.

**Dragout (Step 7):** after plate metal recovery tank to prevent loss of plating solution.

**Post Plating Treatment (Step 9):** can include wax, lacquer, baking, chromate, etc.



Within the Plating Bath tank (6 above) positive charged metal cells are attracted to the negative charged surface to be plated.

This works the same way regardless whether the process is used in large volume barrel plating, reel to reel continuous strip electroplating, or smaller volume rack plating.

The illustration on the next page of the article depicts what takes place inside the Plating Bath tank.

Continued on page 5



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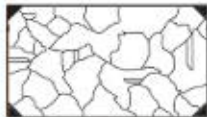
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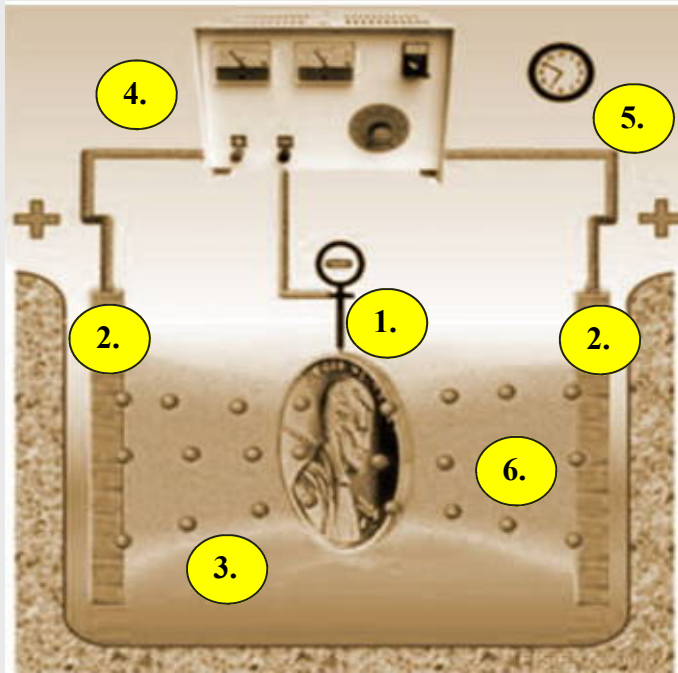
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## HERE IS THE PLATING PROCESS INSIDE THE TANK



### Electrolytic Cell Components:

1. Negative Charged Cathode
2. Anode
3. Plating Bath
4. Rectifier (Amperage, Volt)
5. Time
6. Positive Charged Ions

*Controlling parameters such as voltage, amperage, temperature (4), running times (5) and solution concentration(3), the metal or substrate being plated act as cathode (negative pole) (1), attracting ions from the solution cell discharged through the anode (positive pole)(2). This process of forming a homogeneous layer of metal at the surface of the substrate is achieved by using a Rectifier to supply the current intensity capable of transform electrical energy into chemical energy, providing electrons to reduce the positively charged ions to metallic form. The thickness of the electroplated layer is determined by the plating time.*

## UniMetal's Electroplating Processes

### ZINC PLATING

UniMetal has a specific Zinc deposit for each of your specific applications. It would be easy to analyze, control, and inventory products for one type of zinc plating. But they choose to provide variety and possibilities. Each electrolyte has its attribute and shortcomings (efficiencies, chromate receptivity, throwing power, cost, environmental impact, cosmetic appearance, embrittlement, etc.).

Discuss your specific needs with any one of their technical staff to best match the best deposit characteristics for each of your applications. Their goal is to provide you and your customer with the most cost-effective deposit for each application.

#### Zinc Plating Choices:

##### Acid Chloride Zinc

This finish is compatible with most substrates (base metals). Acid Chloride Zinc is easily plated over most substrates and is the best method if depositing zinc on malleable, high-carbon, heat-treated, and carburized substrates. One of the difficulties with this deposit is its high efficiency; a plating solution that has a high efficiency tends to plate the HCD (high current density) areas faster than the LCD (low current density) area. It is said to have a 10:1 ratio.

##### Alkaline Non-cyanide Zinc

This is considered one of the most environmentally-friendly plating solutions. This is true because it was the first zinc plating solution to mimic the characteristics of cyanide zinc without the aid of cyanide as a grain refiner. It is a wonderful deposit on most common steel substrates. Its best attribute is its throwing power (ability to cover into recesses of parts), especially on deep drawn shell work. These LCD (low current density) areas are generally plated as bright and clear as the significant surfaces of a part. This electrolyte is said to have an HCD to LCD ratio of 3:1.

##### Mechanical Zinc Plating & Mechanical Galvanizing

Also known as peen plating or impact plating, had its origin some 50 years ago. Zinc deposits of less than .001 inches are considered mechanical plating while deposits greater than .001 inches up to .0022 inches are what we call Mechanical Galvanizing. The greatest attribute of any variety of peen plating is its ability to plate a high carbon steel or a spring steel with little or no induced hydrogen, hence no worries of hydrogen embrittlement and no need for subsequent post-plating bake to drive off any included hydrogen.

*Continued on page 9*



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## **NICKEL PLATING**

### **Standard Specification for Electroplated Engineering Nickel Coatings**

This specification covers the requirements for electroplated nickel coatings applied to metal products for engineering applications, for example, for use as a buildup for mis-machined or worn parts, for electronic applications, including as underplates in contacts or interconnections and in certain joining applications. Electroplating of nickel for engineering applications

requires technical considerations significantly different from decorative applications.

#### **Important Functional Properties:**

- **Hardness, strength and ductility**
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- **Load bearing characteristics**
- **Corrosion resistance**
- **Heat scaling resistance**
- **Fretting resistance**
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*Continued on page 11*



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Functional electroplated nickel coatings usually contain about 99 % nickel, and are most frequently electrodeposited from a Watts nickel bath or a nickel sulfamate bath. Typical mechanical properties of nickel electroplated from these baths, and the combined effect of bath operation and solution composition variables on the mechanical properties of the electrodeposit are given in Guide B 832. When electroplated nickel is required to have higher hardnesses, greater wear resistance, certain residual stress values and certain leveling characteristics, sulfur and other substances are incorporated in the nickel deposit through the use of certain addition agents in the electroplating solution.

Nickel is plated from a number of different electrolytes (watts, woods, sulfamate and electroless) and for a number of different purposes (decorative, engineering and barrier coats). Each coating has its own unique properties that can be selected to meet specific customer requirements.

## COPPER PLATING

The industry standard brings requirements for electrodeposited coatings of copper used for engineering purposes. Examples include, heat treatment stop-off, under plating for other engineering coatings, and for electromagnetic interferences (EMI) shielding in electronic circuitry, and in certain joining operations.

Other features include:

- Provides excellent undercoat for nickel and chromium decorative coatings.
- Provides excellent electrical conductivity properties.
- Used as a mask in surface hardening procedures.
- Provides good lubrication in metal forming operations.

### *Copper Plating Thickness Classes*

CLASS	THICKNESS
0	0.00100-0.00500"
1	0.00100" minimum
2	0.00050" minimum
3	0.00020" minimum
4	0.00010" minimum



### The Copper Classes & Thickness

Some metals to be plated resist or hamper plating and do not allow the adhesion needed to ‘seal’ the metals surface. Copper is often used to provide the right surface condition. However, copper itself does not readily plate onto iron-based metal surfaces. To provide the adhesion a surface is given a thin nickel base coat (called a ‘nickel-strike’), which the copper (also often called a ‘copper-strike’) can tightly adhere to.

In some cases where appearance is critical, the copper can be used to fill defective surfaces because it self levels allowing a super smooth surface for applications requiring high polish and sheen. There are two copper plating methods.

### Cyanide Copper Bath

Copper is used as a strike to improve adhesion of the plated deposit to the substrate as well as an inexpensive barrier coat between brass substrates and a tin or tin lead deposit. The zinc in the brass likes to migrate into tin and tin lead deposits used in the electronic industry. A copper barrier coat of no less

*Continued on Page 13*



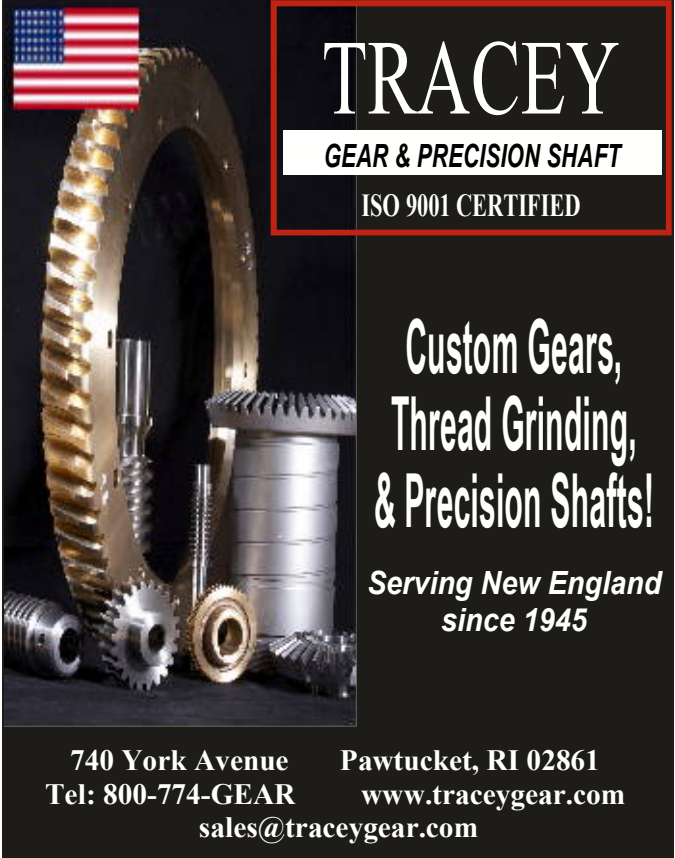
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## TIN PLATING CLASSIFICATIONS

CLASS	Minimum Thickness	Typical Application
A	2.5 $\mu\text{m}$ - 0.0001"	Electrical Contact (Not to be soldered)
B	5.0 $\mu\text{m}$ - 0.0002"	For mild service conditions (To facilitate Soldering)
C	8.0 $\mu\text{m}$ - 0.00031" 10 $\mu\text{m}$ - .00039 for steel substrate	Electrical Hardware, Frames, Chassis
D	15 $\mu\text{m}$ - 0.00059" 20 $\mu\text{m}$ - .00078 for steel substrate	Electrical connectors for severe services, automotive accessories
E	30 $\mu\text{m}$ - 0.00118"	Very severe conditions, high temperatures, abrasion and corrosive atmospheres or gases.

than .000050 inches tends to slow down the migration of the zinc into the final deposit which will greatly improve the shelf life of a product, especially if future solderability is required. It should be noted that the best barrier coat for shelf life purposes would be a watts or sulfamate nickel deposit of no less than .000050 inches. Since nickel has a much tighter grain structure than copper, it can hold off the zinc migration 10 times longer than a copper barrier coat.

### Acid Copper Sulfate Bath

Are widely used in the area of printed circuits, electronics, rotogravure, plating on plastics, decorative copper and electroforming applications. While the deposit of copper from an acid based electrolyte is often more efficient, less expensive and easier to waste treat and other alkaline solutions, it too has its drawbacks. Most importantly, steel parts must be plated with a cyanide copper or a nickel strike to prevent immersion copper from forming on the substrate. This will cause a very poor bond between the base metal and the acid copper deposit that will blister or peel causing a reject.

## TIN PLATING

Standard Specification for Electrodeposited Coatings of Tin

Tin and tin/lead are deposited in many forms and from a number of different electrolytes. There is bright tin, matte tin, 90/10 tin/lead, 60/40 tin/lead, deposited from sulfate, fluoborate, ethane-sulfonic acid based solutions. Tin can also be plated from an alkaline stannate bath. Tin and its alloy are primarily plated for their solderability and electrical characteristics.

### Tin Coatings are Used to Plate Components for:

- Engineering
- Military
- Communications
- Consumer product devices

The Tin provides a low contact-resistance surface, to protect against corrosion, to facilitate soldering and provides anti-galling properties.

When purchasing Tin Plating the purchase order must reference the following information:

- ASTM Specification and year of issue.
  - Composition and metallurgical condition of the substrate.
  - Service class (A, B, C, D, E)
- Underplating or substrate (if required)

**Next month's installment will pick up with  
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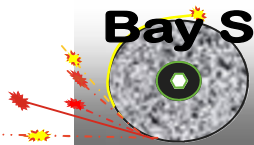
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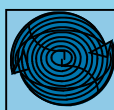
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## PRESS RELEASE

### Tool Tek, Inc. Joins DG Precision Mfg. Team

Woodbury, CT - January 1, 2017: Michael Schneider and his team from Tool Tek, Inc. joined the team of DG Precision Mfg. at 90 Washington Road in Woodbury, CT on January 1, 2017. This team building is a joint effort to provide both companies customers with a wider array of services in one manufacturing facility. The goal is to make this as smooth a transition for both the customers and companies as possible.

“We are very excited to have Tool Tek, Inc. join our team with their 44 years of experience in specialized manufacturing as well as its talented and highly skilled team.” says David Duda, President of DG Precision. “We are looking forward to Michael Schneider playing an integral role in the daily operations at DG Precision.”

Brian Duda, Vice President of DG Precision Mfg. “We are pleased that our 3rd generation family run business which has been serving the manufacturing industry for the past 70 years, can join with a 2nd generation family business with over 44 years to help keep manufacturing alive and well in CT.”



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## PRESS RELEASE

### Acme Wire Products Recognizes Advisor Contributions and Service

Acme Wire Products Advisory Board gathered at the Harbour House in Mystic, CT to celebrate and recognize the contributions of John H. White, Jr., a long time Acme Wire Products advisor.

John served on the Acme Wire Products' advisory team from 1999 to 2015. He contributed to the company's successful transition from first generation founder, Edward Planeta, Sr. to second generation sibling team of Mary Planeta Fitzgerald, Edward Planeta, Jr., and Michael Planeta. Over the years, John has continually inspired and encouraged Acme Wire Products' owners to focus on high level management concepts and simplified financial reporting. He was also instrumental for his insight in equipment acquisition strategies.

John is the Chief Executive Officer of Taco, Inc., a Cranston, RI based company which develops and manufactures hydronic- based components for use in heating and cooling applications across the building spectrum - residential, commercial, industrial and institutional. Taco is a 3rd generation family business which employs some 500 persons with annual sales in excess of \$100 million.

The Planeta siblings were joined by other Acme Wire Products advisors in the celebration. John was presented with an engraved ice bucket and a case of limited edition Planeta wine. All present toasted John's participation, his continued good health and future endeavors.



*Advisor John H. White, Jr. is recognized by Acme Wire Products' owners during recent celebration.*

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## PRESS RELEASE

### Sturbridge Metallurgical Obtains Sikorsky Approval.

**Effective January 6, 2017, Sturbridge Metallurgical Services, Inc. of Sturbridge MA is approved as a Materials Testing Lab for Sikorsky Aircraft Corporation (A Lockheed Martin Corporation) and its manufacturing supplier base.**

#### Building a Strong Quality Organization

Sturbridge Metallurgical's founder and president, Mr. Courtney Grimes, has been building his business since 1990. "My vision has been to build a testing lab that is dedicated to providing the highest quality testing services and technical reports available for the Medical, Aerospace and Industrial markets" says Grimes. "While at the same time providing this level of quality in a timely and cost effective manner".

"Our team has worked extremely hard to put the systems in place to ensure organizations like Sikorsky and their supply chain will want to have their parts tested here" said Brendan Fullam, General Manager and Business Development Manager at Sturbridge Metallurgical Services Inc. "We have a great team here and everyone works very hard to keep our customers happy. Having Sikorsky grant us approval validates all of the effort and time that they have put into the organization and keeps us even more focused on demanding the best from ourselves".

#### What This Means for Suppliers

For manufacturers, suppliers and/or vendors of Sikorsky or Sikorsky directly can now utilize the full scope of Sturbridge Metallurgical's material testing capabilities. Suppliers can access their approved certification letter through the Sturbridge Metallurgical website ([www.smslabs.com](http://www.smslabs.com)) and navigate to the quality assurance section.

#### Testing Services Offered

Sturbridge Metallurgical Services offers Chemical Analysis, SEM/EDS Analysis, Failure Analysis, Tensile Testing, GE Grain Size Ratings, Corrosion Testing, Metallography, Hardness and Microhardness Testing and a variety of other metallurgical testing services.

#### About Sturbridge Metallurgical Services

Sturbridge Metallurgical Services, Inc. was founded in 1990 by Courtney Grimes. They currently have 10 employees and occupy an 8,000+ square foot facility in Sturbridge, MA. They offer materials testing services, metallurgical equipment for in-house labs and metallurgical consumable supplies. They are A2LA ISO 17025 Accredited, Nadcap Accredited, GE S400 Approved, ITAR Registered, Sikorsky Approved and have their Federal Firearms License (FFL).

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- It's physically impossible for you to lick your elbow.
- The Main Library at Indiana University sinks over an inch every year because when it was built, engineers failed to take into account the weight of all the books that would occupy the building.
- A snail can sleep for three years..
- No word in the English language rhymes with "MONTH."
- Average life span of a major league baseball: 5 pitches.
- An ostrich's eye is bigger than its brain.
- The electric chair was invented by a dentist.
- Our eyes are always the same size from birth, but our nose and ears never stop growing. SCARY!!!
- All polar bears are left-handed.
- In ancient Egypt, priests plucked EVERY hair from their bodies, including their eyebrows and eyelashes.
- TYPEWRITER is the longest word that can be made using the letters only on one row of the keyboard.
- "Go," is the shortest complete sentence in the English language.
- If Barbie were life-size, her measurements would be 39-23-33. She would stand seven feet, two inches tall.
- Now the real facts ... Did you try to lick your elbow?

## The Gateway Magazine

Bill Bryson, President

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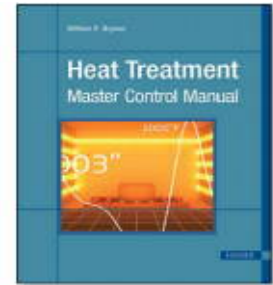
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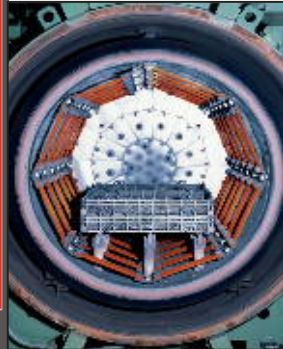
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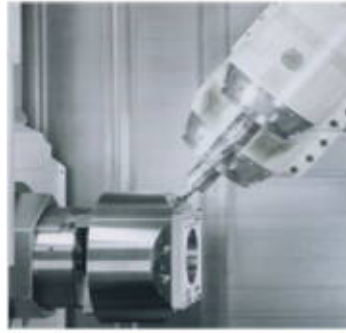
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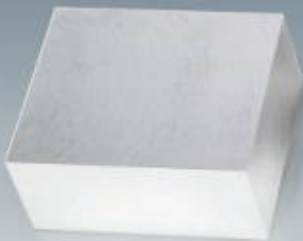
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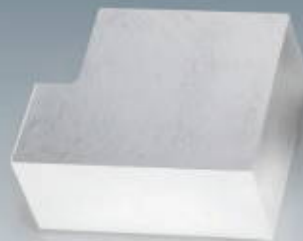
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