



### SLM 3D Printing:

**SLM** (Selective Laser Melting) is a 3D printing process that uses a high-power laser to melt and fuse powdered metal layer by layer. It is used for producing complex, high-precision metal parts. The process involves a laser head moving across a bed of powder, creating a cross-section of the part. The process is repeated until the entire part is built. The resulting parts are strong and have excellent mechanical properties.

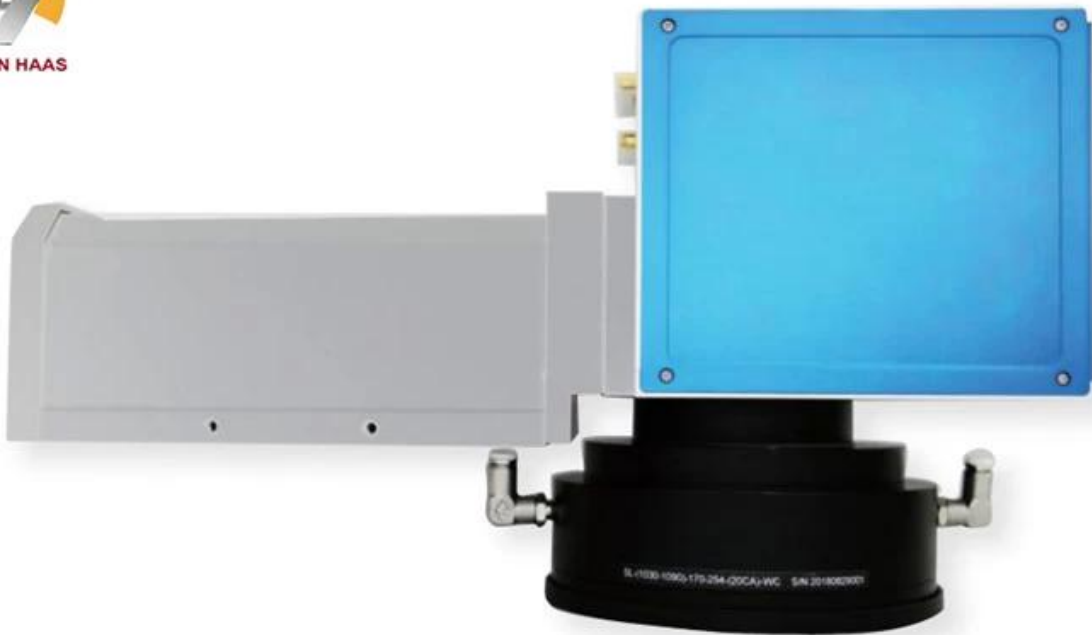
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CARMANHAAS is a 3D printing company that specializes in SLM. They offer a wide range of services, including design, production, and post-processing. They use a high-power laser to melt and fuse powdered metal layer by layer. They offer a wide range of services, including design, production, and post-processing. They use a high-power laser to melt and fuse powdered metal layer by layer.

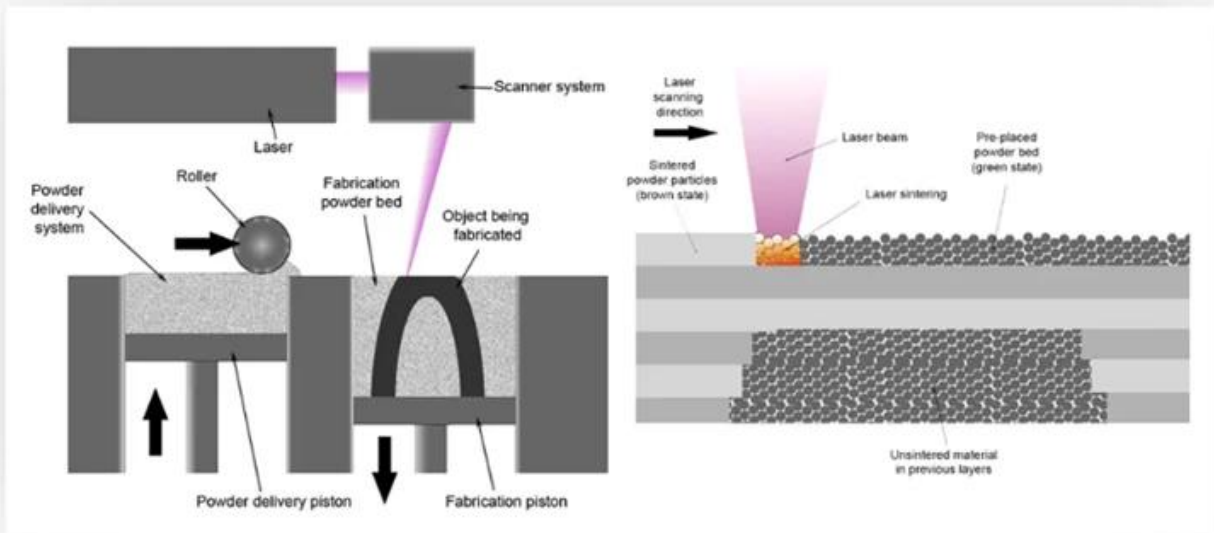
### Advantages:

- (1) High precision and accuracy; 1KW laser power;
- (2) Ability to produce complex, high-precision metal parts;
- (3) High strength and mechanical properties; 5000 MPa / 5000 MPa;
- (4) High surface finish; 1um surface finish.

### QBH 3D Printing



# How Does It Work?



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**1030-1090nm** □□□□□ □□□□□ □□□

Model	PSH14-H	PSH20-H	PSH30-H
<b>Input laser power (MAX.)</b>	CW: 1000W @ fiber laser Pulsed: 500W @ fiber laser	CW: 3000W @ fiber laser Pulsed: 1500W @ fiber laser	CW: 1000W @ fiber laser Pulsed: 150W @ fiber laser
<b>Water cool/sealed scan head</b>	yes	yes	yes
<b>Aperture (mm)</b>	14	20	30
<b>Effective Scan Angle</b>	±10°	±10°	±10°
<b>Tracking Error</b>	0.19 ms	0.28ms	0.45ms
<b>Step Response Time(1% of full scale)</b>	≤ 0.4 ms	≤ 0.6 ms	≤ 0.9 ms
<b>Typical Speed</b>			
<b>Positioning / jump</b>	< 15 m/s	< 12 m/s	< 9 m/s
<b>Line scanning/raster scanning</b>	< 10 m/s	< 7 m/s	< 4 m/s
<b>Typical vector scanning</b>	< 4 m/s	< 3 m/s	< 2 m/s
<b>Good Writing quality</b>	700 cps	450 cps	260 cps
<b>High writing quality</b>	550 cps	320 cps	180 cps
<b>Precision</b>			
<b>Linearity</b>	99.9%	99.9%	99.9%
<b>Resolution</b>	≤ 1 urad	≤ 1 urad	≤ 1 urad
<b>Repeatability</b>	≤ 2 urad	≤ 2 urad	≤ 2 urad
<b>Temperature Drift</b>			
<b>Offset Drift</b>	≤ 3 urad/°C	≤ 3 urad/°C	≤ 3 urad/°C
<b>Over 8hours Long-Term Offset Drift ( After 15min warn-up )</b>	≤ 30 urad	≤ 30 urad	≤ 30 urad
<b>Operating Temperature Range</b>	25°C±10°C	25°C±10°C	25°C±10°C
<b>Signal Interface</b>	Analog: ±10V Digital: XY2-100 protocol	Analog: ±10V Digital: XY2-100 protocol	Analog: ±10V Digital: XY2-100 protocol
<b>Input Power Requirement (DC)</b>	±15V@ 4A Max RMS	±15V@ 4A Max RMS	±15V@ 4A Max RMS

### 1030-1090nm 光纤激光器 规格

Part Description	Focal Length (mm)	Scan Field (mm)	Max Entrance Pupil (mm)	Working Distance(mm)	Mounting Thread
SL-(1030-1090)-170-254-(20CA)-WC	254	170x170	20	290	M85x1
SL-(1030-1090)-250-425-(30CA)-WC	425	250x250	30	475	M132x1
SL-(1030-1090)-142-277-(15CA)-WC	277	142x142	15	340	M85x1
SL-(1030-1090)-254-420-(15CA)-WC	420	254x254	15	509	M85x1
SL-(1030-1090)-230-420-(20CA)-WC	420	230x230	20	509	M85x1
SL-(1030-1090)-410-650-(20CA)-WC	650	410x410	20	562	M85x1

**1030-1090nm** □□□ □□□□□□□□

Part Description	Expansion Ratio	Input CA (mm)	Output CA (mm)	Housing Dia(mm)	Housing Length(mm)	Mounting Thread
BE-(1030-1090)-D26:45-1.5x-A	1.5X	18	26	44	45	M30x1 M43x0.5
BE-(1030-1090)-D53:118.6-2x-A	2X	30	53	49	118.6	M30x1
BE-(1030-1090)-D37:118.5-2x-A-WC	2X	18	37	59	118.5	M30x1

**1030-1090nm** □□□□□□□□□□ □□□□□

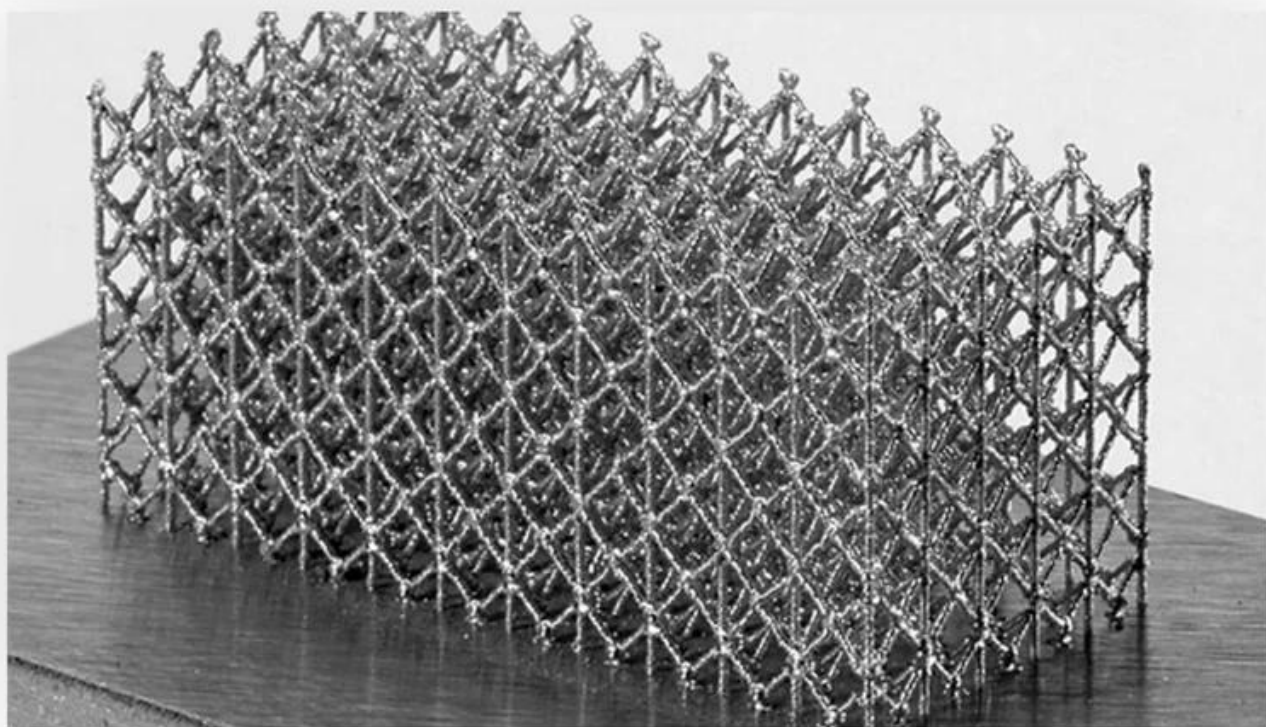
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□□□□□□□□□□ □□□□□□	98	4	□□□ / □ □□ @ 1030-1090nm
□□□□□□□□□□ □□□□□□	113	5	□□□ / □ □□ @ 1030-1090nm
□□□□□□□□□□ □□□□□□	120	5	□□□ / □ □□ @ 1030-1090nm
□□□□□□□□□□ □□□□□□	160	8	□□□ / □ □□ @ 1030-1090nm

**1030-1090nm QBH Collimating** □□□□□□ □□□□□□□

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CL2- (1030-1090) -30-F60-QBH-□-WC	60	28	0.22	□□□ / □ □□ @ 1030-1090nm
CL2- (1030-1090) -30-F75-QBH-□-WC	75	28	0.17	□□□ / □ □□ @ 1030-1090nm
CL2- (1030-1090) -30-F100-QBH-□-WC	100	28	0.13	□□□ / □ □□ @ 1030-1090nm
CL2- (1030-1090) -38-F75-QBH-□-WC	75	34	0.22	□□□ / □ □□ @ 1030-1090nm
CL2- (1030-1090) -38-F100-QBH-□-WC	100	34	0.16	□□□ / □ □□ @ 1030-1090nm
CL2- (1030-1090) -38-F125-QBH-□-WC	125	34	0.13	□□□ / □ □□ @ 1030-1090nm

SELECTIVE LASER MELTING (SLM)

## Pros and Cons





# Stainless Steel

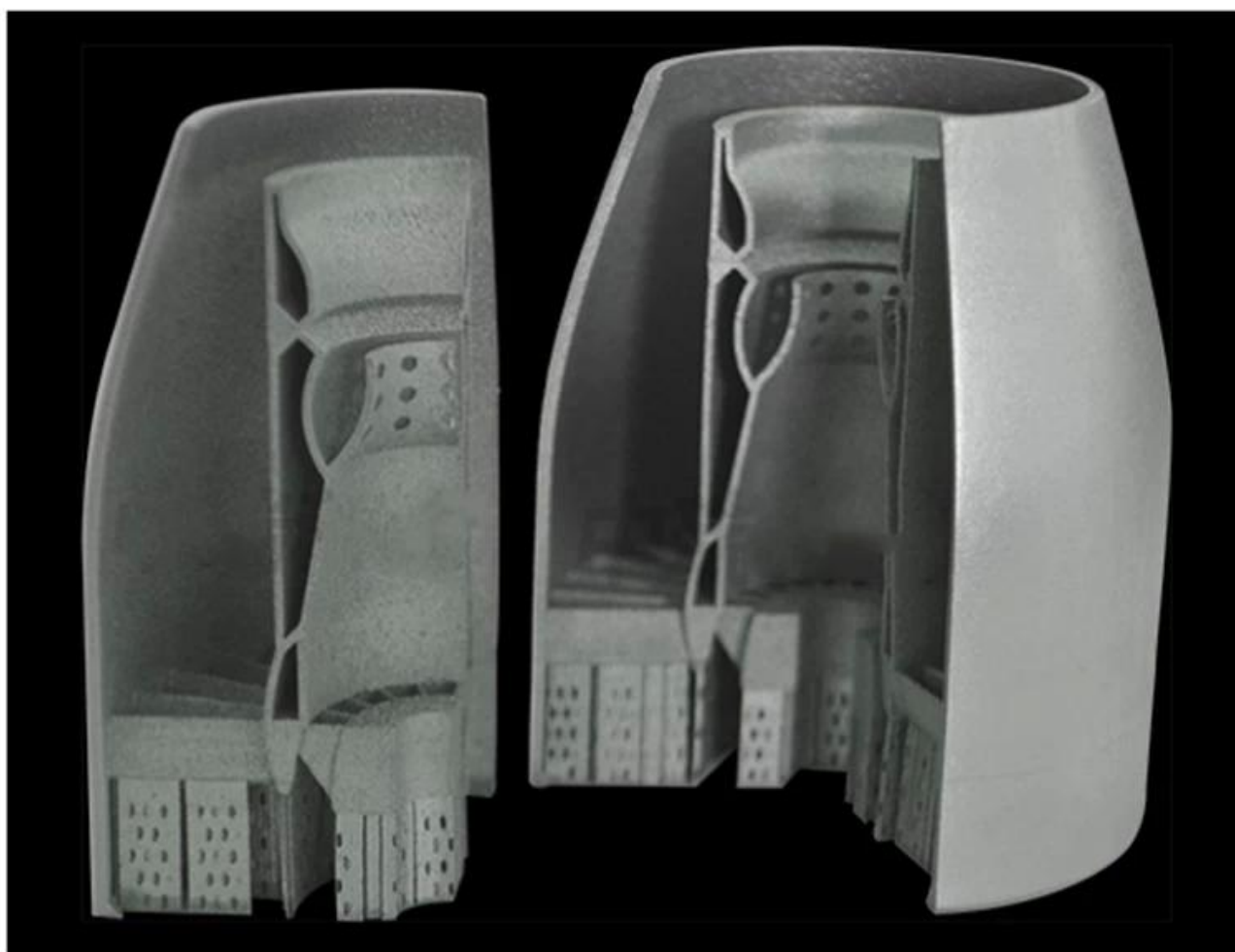


## Die Steel

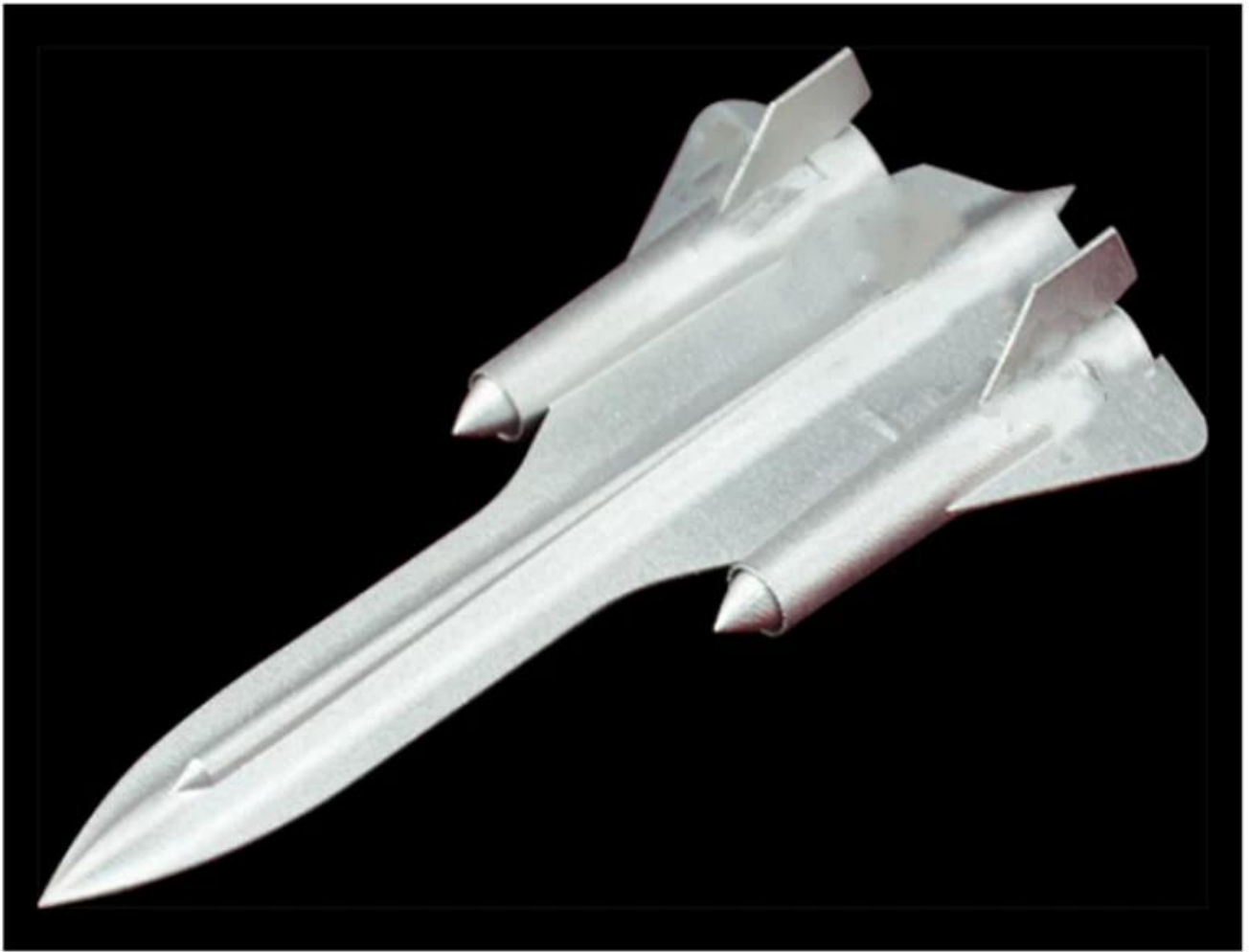




# Titanium Alloy



# Aluminium Alloy ( $AlSi_{10}Mg$ )



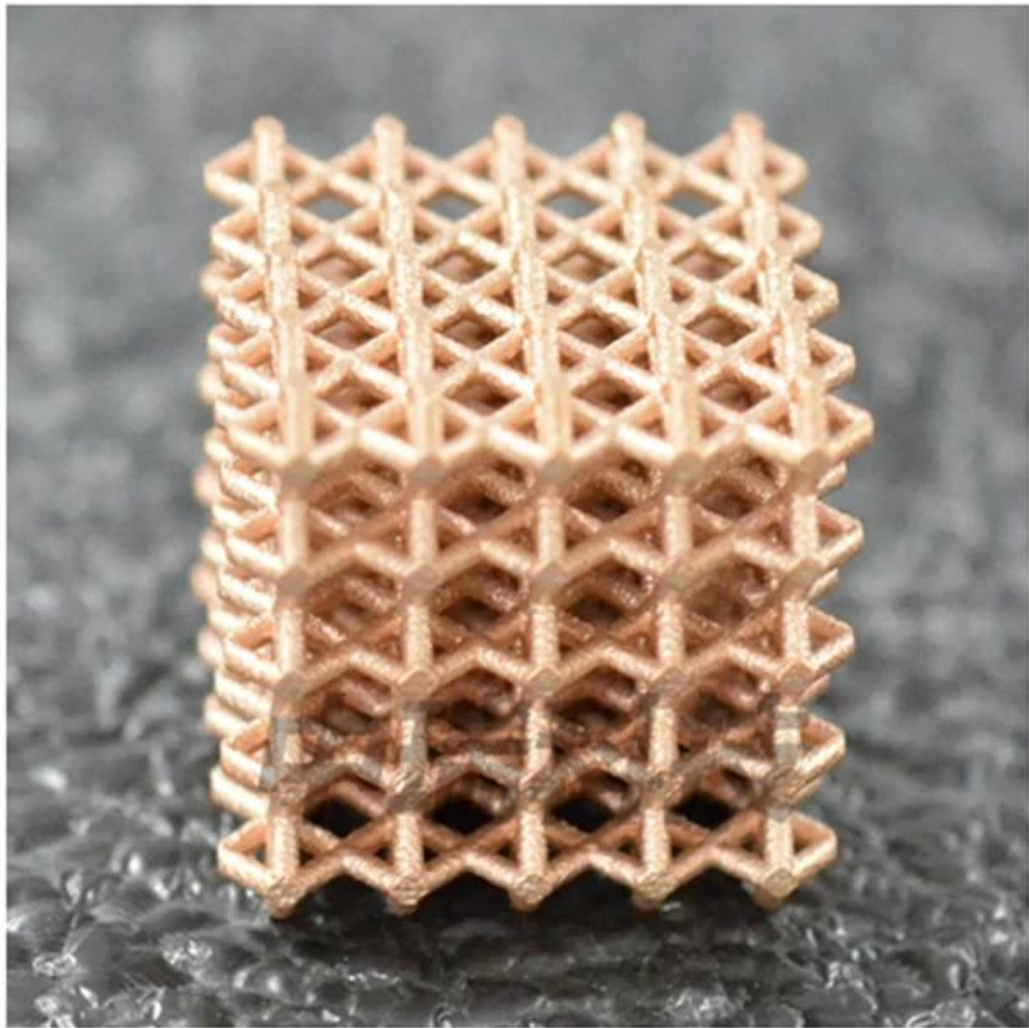
Co-Cr Alloy ( MP1 )



## Ni-base Superalloy



# Chromium Bronze ( QCr1 )



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**TRIOPTICS OptiSpheric 2000 AF**  
---Testing EFL, R, Centering Error, Wedge Angle, BFL, MTF



**PerkinElmer Lambda 950**---Testing Transmission and Reflectivity



**Carmanhaas Coating Machine**







Question 1:

Q1) What are the main types of international trade agreements?

Q2) Explain the difference between a trade tariff and a trade subsidy.

Q3) How does a trade agreement affect the balance of payments?

Q4) What are the main factors influencing the success of an international trade agreement?

Answer:

(1) Trade agreements can be classified into bilateral, regional, and multilateral. Bilateral agreements are between two countries, regional agreements are between a group of countries in a specific region, and multilateral agreements are between many countries. Examples include the North American Free Trade Agreement (NAFTA), the European Union (EU), and the World Trade Organization (WTO). Other examples include the General Agreement on Trade and Tariffs (GATT), the Free Trade Area of the Americas (FTAA), and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP).

(2) A trade tariff is a tax imposed on imported goods, while a trade subsidy is a financial contribution from the government to support domestic industries. Tariffs are used to protect domestic industries from foreign competition, while subsidies are used to promote domestic industries and exports.

» » » » » Question 2

Q1) What is a trade tariff?

A1: A trade tariff is a tax imposed on imported goods. It is used to protect domestic industries from foreign competition and to generate revenue for the government.

Question 2: How does a trade agreement affect the balance of payments?

A2: A trade agreement can affect the balance of payments in several ways. It can increase exports and decrease imports, leading to a trade surplus. It can also lead to currency depreciation, which can increase exports and decrease imports. Finally, it can lead to currency appreciation, which can decrease exports and increase imports.

Question 3: How does a trade agreement affect the balance of payments?

A3: A trade agreement can affect the balance of payments in several ways. It can increase exports and decrease imports, leading to a trade surplus. It can also lead to currency depreciation, which can increase exports and decrease imports. Finally, it can lead to currency appreciation, which can decrease exports and increase imports.

Q4) How does a trade agreement affect the balance of payments?

A4: A trade agreement can affect the balance of payments in several ways. It can increase exports and decrease imports, leading to a trade surplus. It can also lead to currency depreciation, which can increase exports and decrease imports. Finally, it can lead to currency appreciation, which can decrease exports and increase imports.

Q5) May a trade agreement affect the balance of payments?

A5: Yes! A trade agreement can affect the balance of payments in several ways. It can increase exports and decrease imports, leading to a trade surplus. It can also lead to currency depreciation, which can increase exports and decrease imports. Finally, it can lead to currency appreciation, which can decrease exports and increase imports.

Q6) What are the main factors influencing the success of an international trade agreement?

A6: The main factors influencing the success of an international trade agreement are the political, economic, and social conditions of the countries involved, the nature of the agreement, and the effectiveness of the institutions that enforce the agreement.

Q7) How does a trade agreement affect the balance of payments?

A7: A trade agreement can affect the balance of payments in several ways. It can increase exports and decrease imports, leading to a trade surplus. It can also lead to currency depreciation, which can increase exports and decrease imports. Finally, it can lead to currency appreciation, which can decrease exports and increase imports.

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