

2026

Huasheng DLC Series

wear-resistant and anti-friction coating equipment

To be the top surface solution supplier in the world

Striving for reduction of industrial energy consumption



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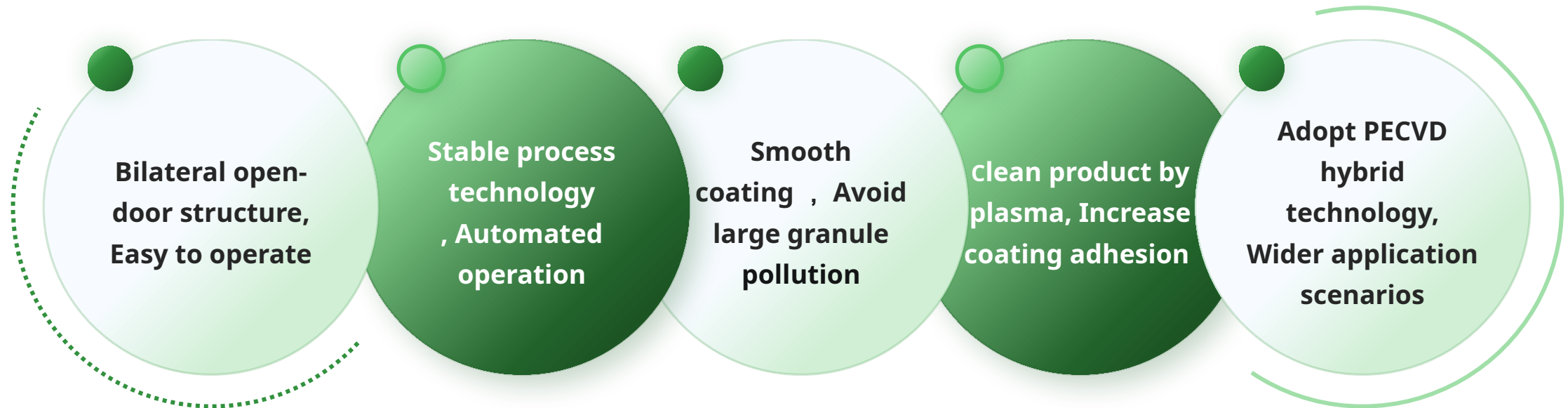
DLC Series Equipment Process & Application



DLC Series Equipment Introduction

DLC Series Equipment Introduction

The DLC series vacuum coating equipment independently developed by Huasheng combines the technical advantages of ion source, magnetron sputtering and PECVD technology , which can quickly deposit diamond-like coating with the characteristics of wear-resistance & anti-friction, smooth surface, high hardness, anti-corrosion, low friction coefficient, and anti-sticking.



02

DLC Series Equipment Characteristics

DLC Series Equipment Characteristic

Plasma etching (Ion Source)

- ✓ High energy plasma, clean product surface
- ✓ Atomic etching without affecting the roughness of the product
- ✓ Easy maintenance

Transition layer deposition Dc magnetron sputtering (DCMS)

- ✓ Unbalanced magnetic field design, high target utilization
- ✓ Transition layer options: Cr 、 WC 、 Ti...
- ✓ Better coating quality
- ✓ lower film stress

DLC layer deposition PECVD: Plasma enhanced chemical vapor deposition (PECVD)

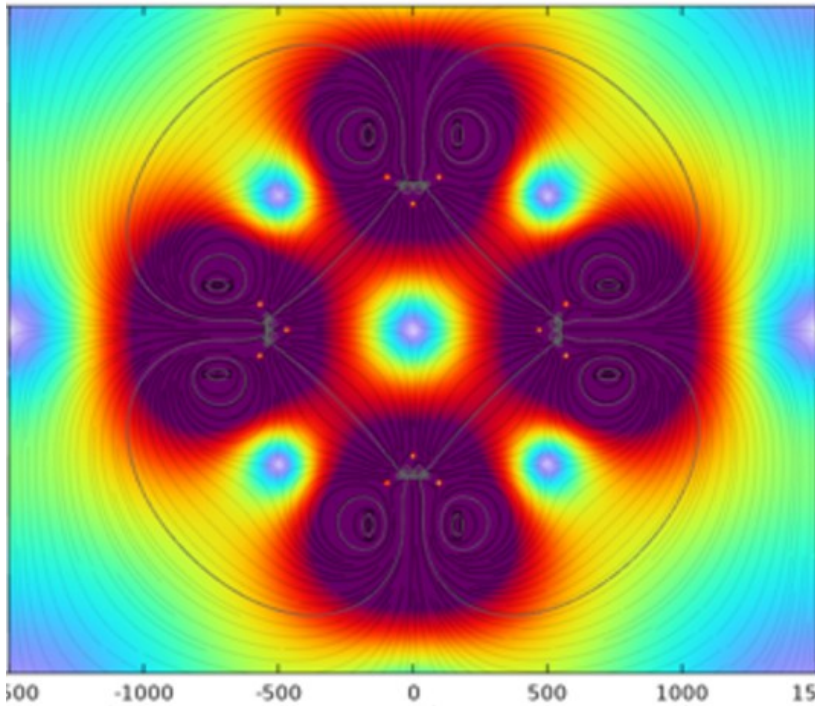
- ✓ Preparation of hydrogen-containing DLC coating
- ✓ Electromagnetic fields interact to ionize the gas
- ✓ No need for maintenance
- ✓ High deposition efficiency
- ✓ More suitable for complex shape parts

DLC Series Equipment Characteristics

- Simple hardware design, no additional ionization source required
- Compound magnetic field design, increase ionization rate

High Deposition Rate $> 1\mu\text{m/h}$, fast deposition speed $> 1\mu\text{m/h}$

- Low deposition temperature $< 250^\circ\text{C}$
- Smooth coating, avoid large granule pollution
- Plasma clean product, no need for maintenance



unbalanced closed magnetic field simulation



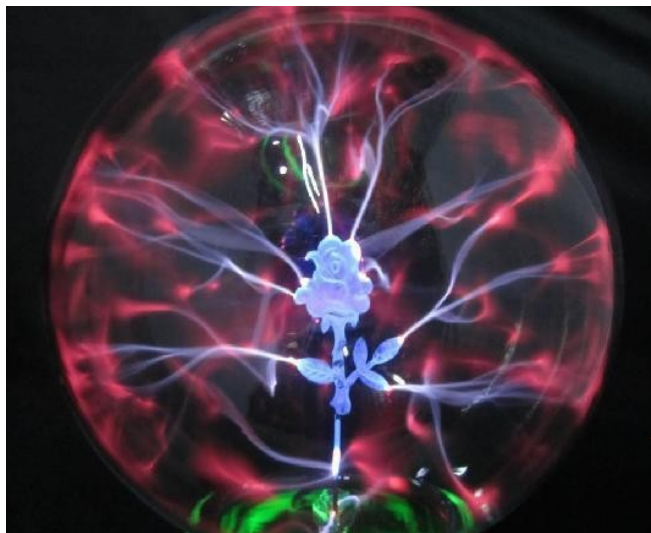
high density plasma



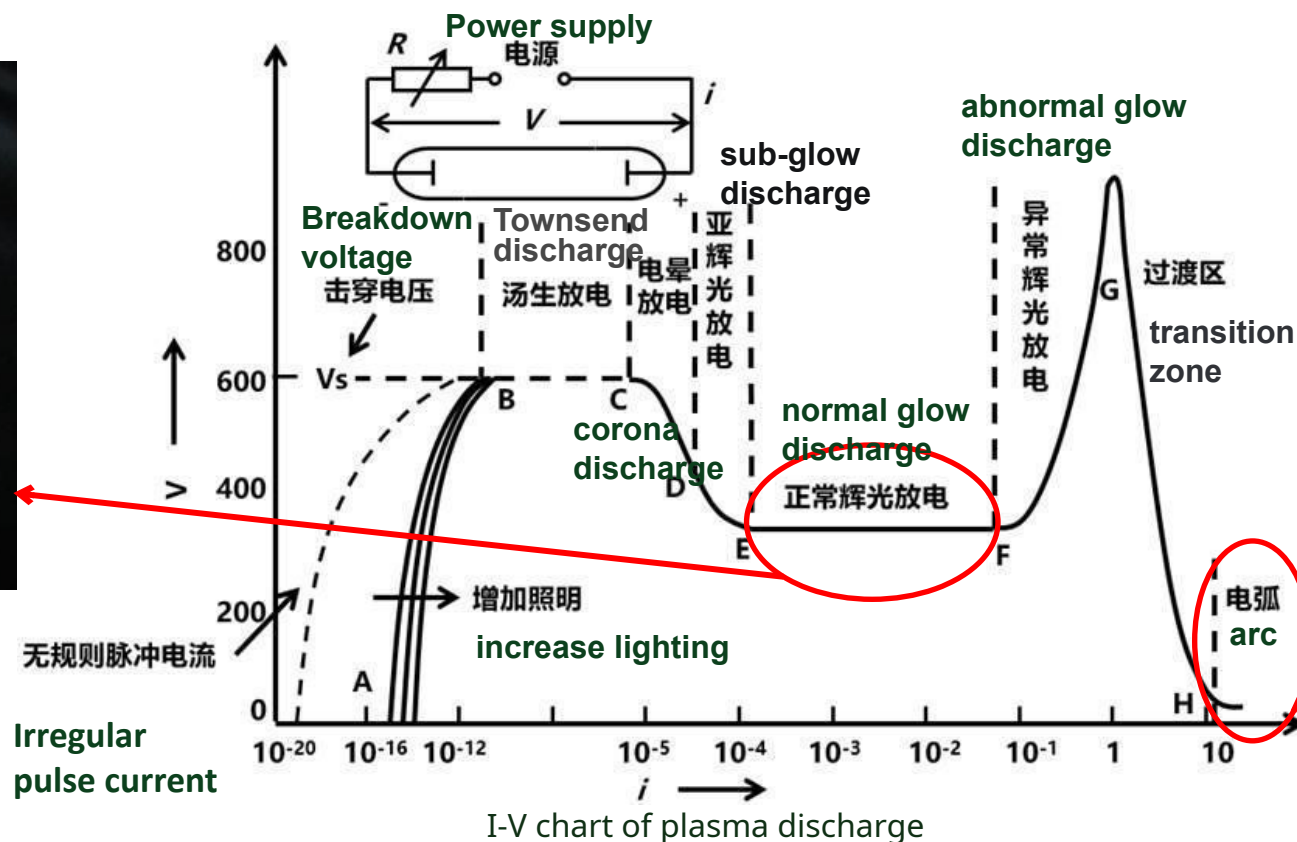
Plasma clean product

DLC Series Equipment Characteristic

- Workpiece will be processed surface by glow discharge before coating, which removes impurities on the surface and ensures better coating adhesion performance.
- The DLC coating is deposited under the effect of glow discharge, forming the smooth and dense coating.



Glow discharge in electrostatic sphere



I-V chart of plasma discharge



Arc discharge in lightning

DLC Three-Elements Diagram



Diamond: tetrahedral structure

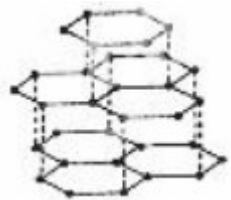
sp^3

ta-C
(hydrogen-free DLC)

a-C:H
(DLC with hydrogen)

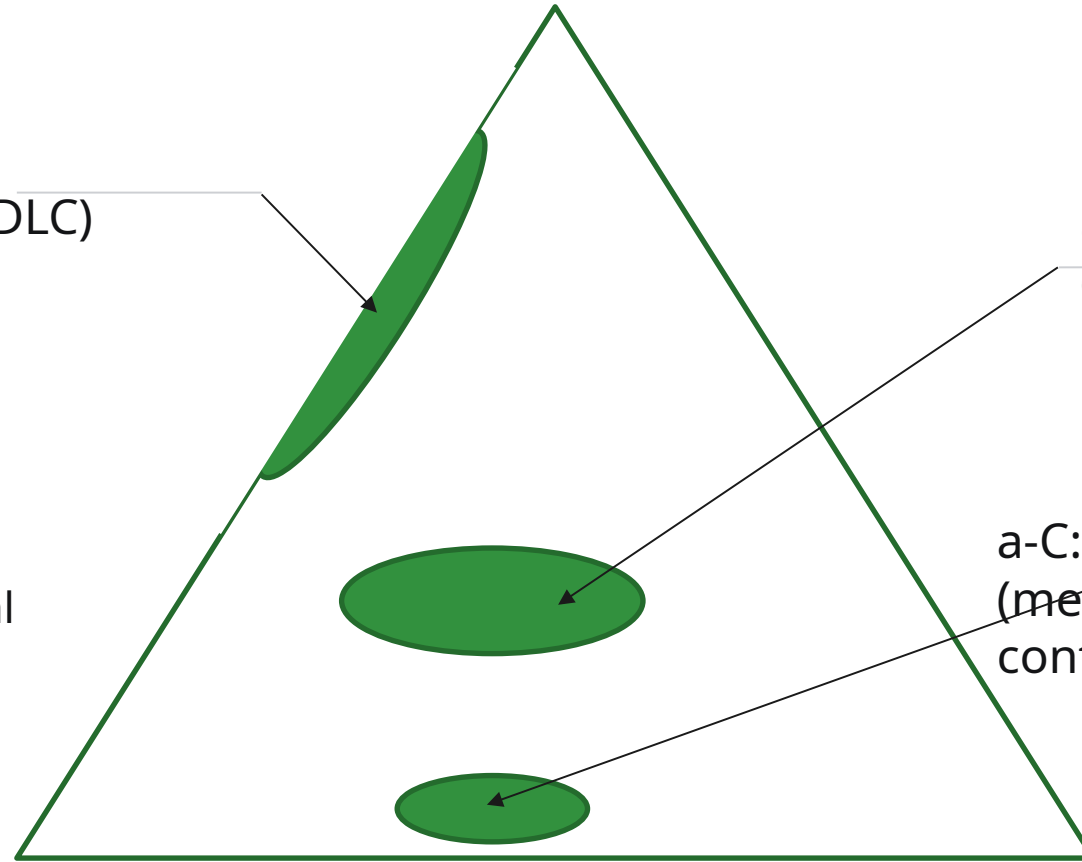
a-C:H:Me
(metal-doped & hydrogen-containing DLC)

Graphite: regular hexagonal layered structure



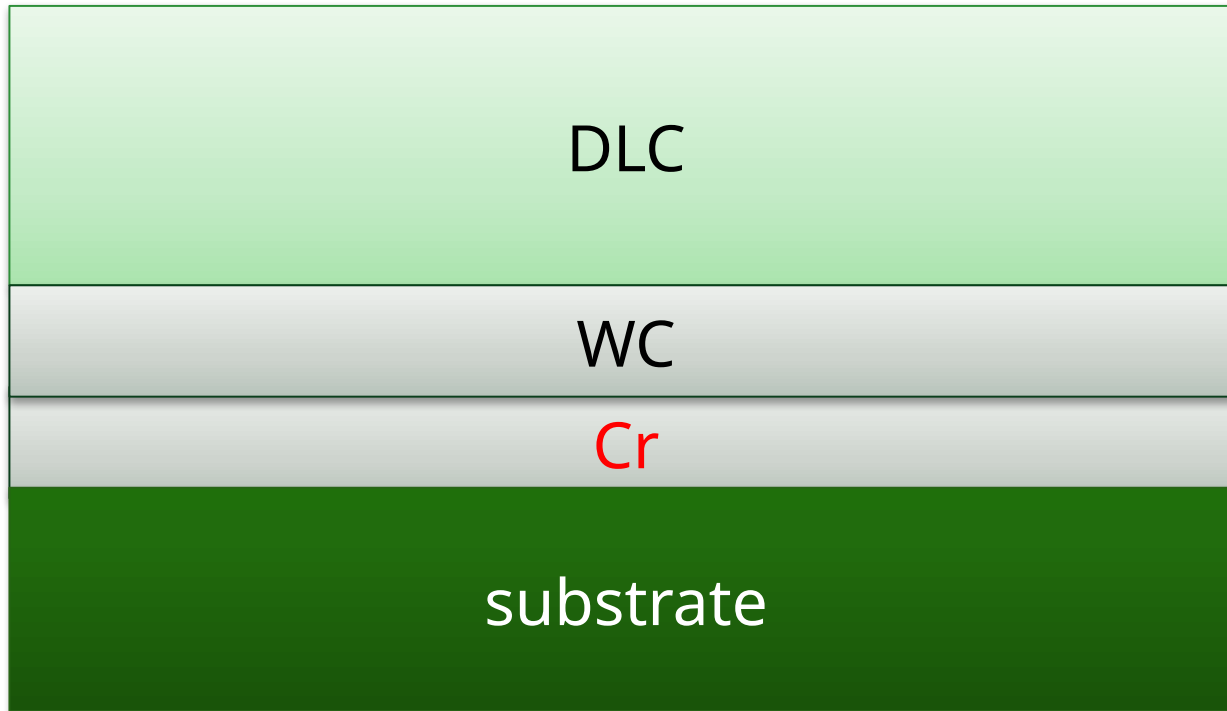
sp^2

H

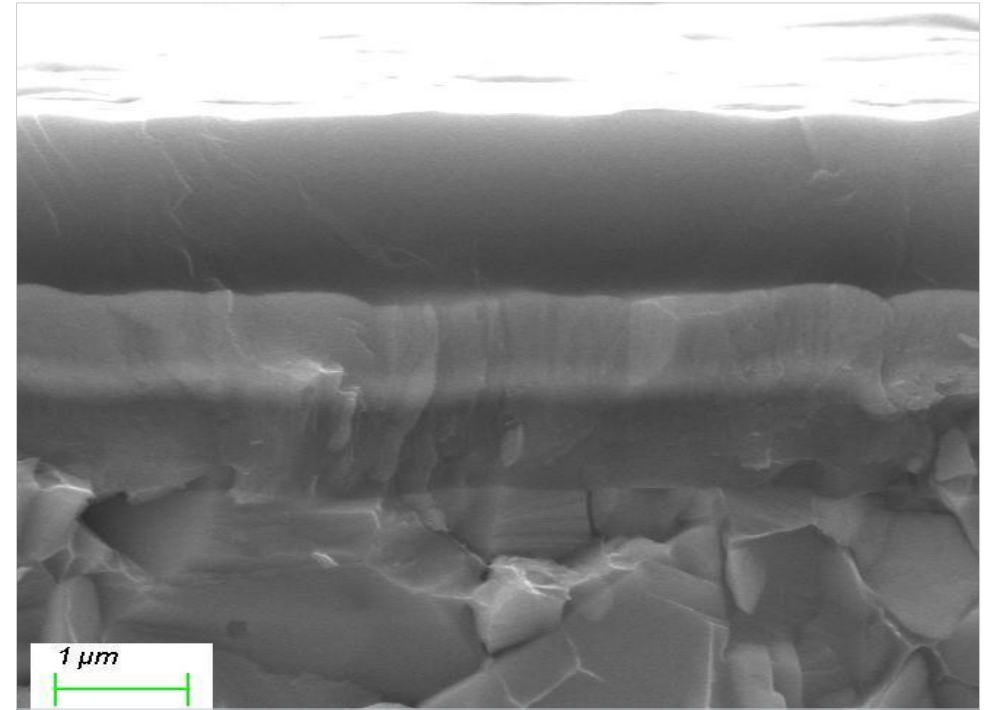


Structural design Characteristics of Huasheng DLC coating

The structure design of Huasheng DLC coating is based on the coating requirements for parts such as wear-resistance, lubrication, anti-corrosion and high binding strength , following the design concepts of “Multilayer structure” “Gradient transition” and “Incision Integration”

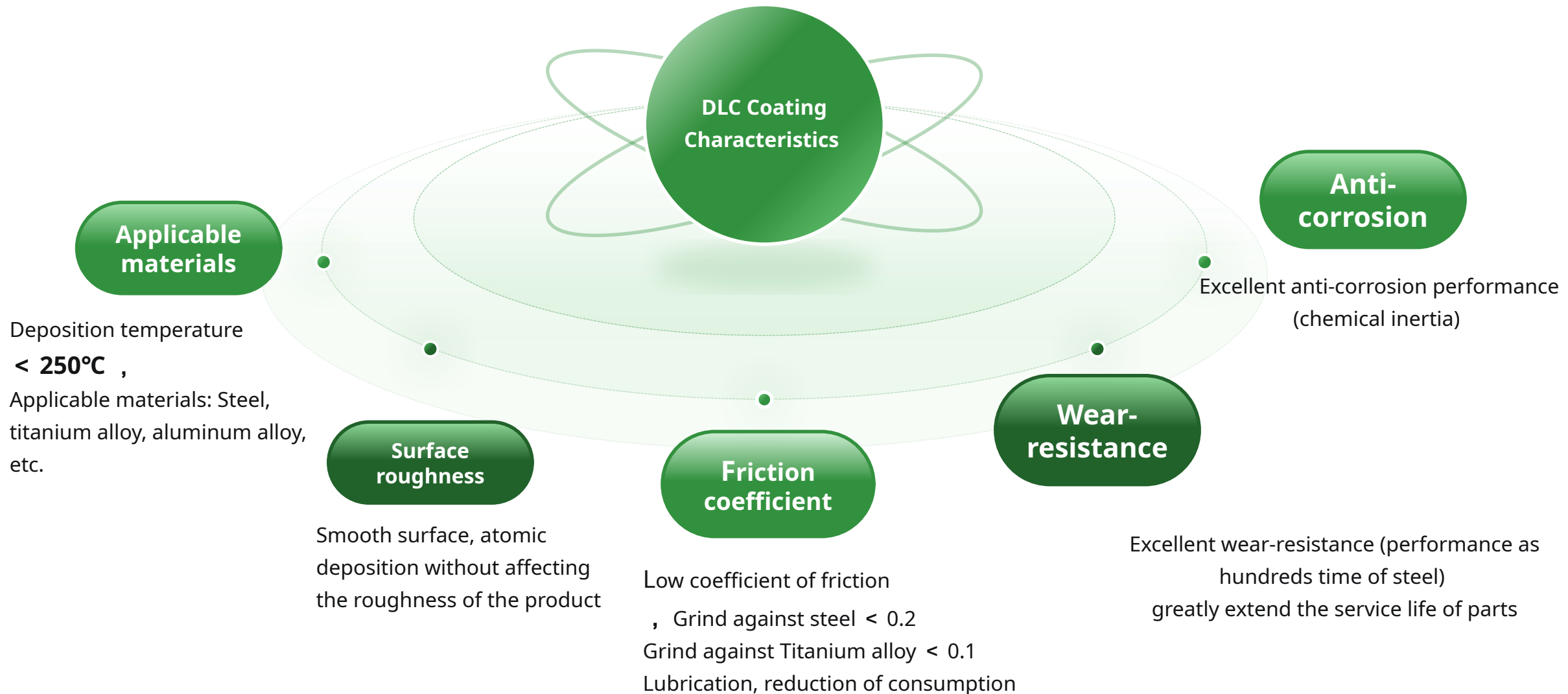


DLC coating structure design



Coating 2-4μm

Huasheng DLC Coating Characteristics



03

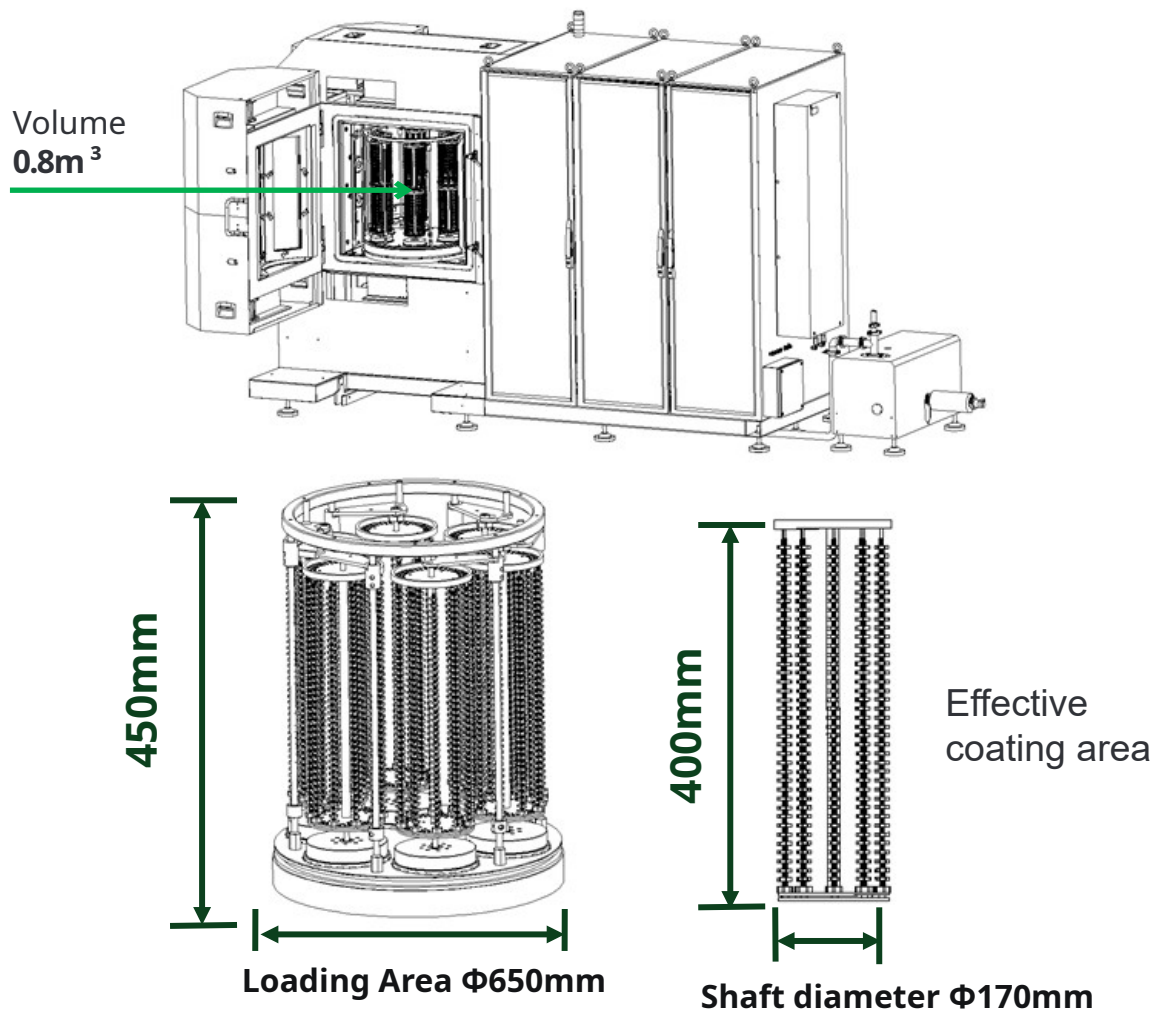
DLC Series Equipment Parameter

DLC Series Equipment Parameter



Model	DLC800	DLC1500	DLC1500PLUS
Coating Technology	MS+PECVD (Magnetron Sputtering +PECVD)		(Magnetron Sputtering + PECVD / Magnetron Sputtering + Anode Layer Ion Source)
Coating Type	Cr/WC/a-C:H		
Etching	SET		
Cathodes (number)	4		
Equipment Size	L4850×W1600×H2400(mm) Length4850*Width1600* Hight2400	Length4900*Width2000* Hight2750	Length4900*Width2000* Hight2750
Cavity Volume	0.8	2	2
Effective Coating Area	Φ650*400	Φ940*1000mm	Φ940*1000mm
Coating Deposition Temperature	< 200		
Capacity (number of trees)	made-to-order	made-to-order	made-to-order
Max. Loading Weigh (KG)	500	1000	1000
Shaft Diameter (mm)	Φ170	largest dimensionΦ350	largest dimensionΦ350
Processing time (h)	6~8	6~8	6~8

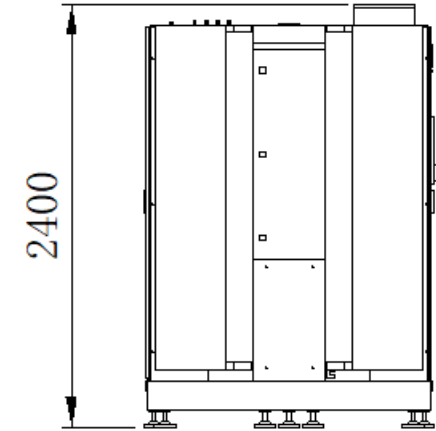
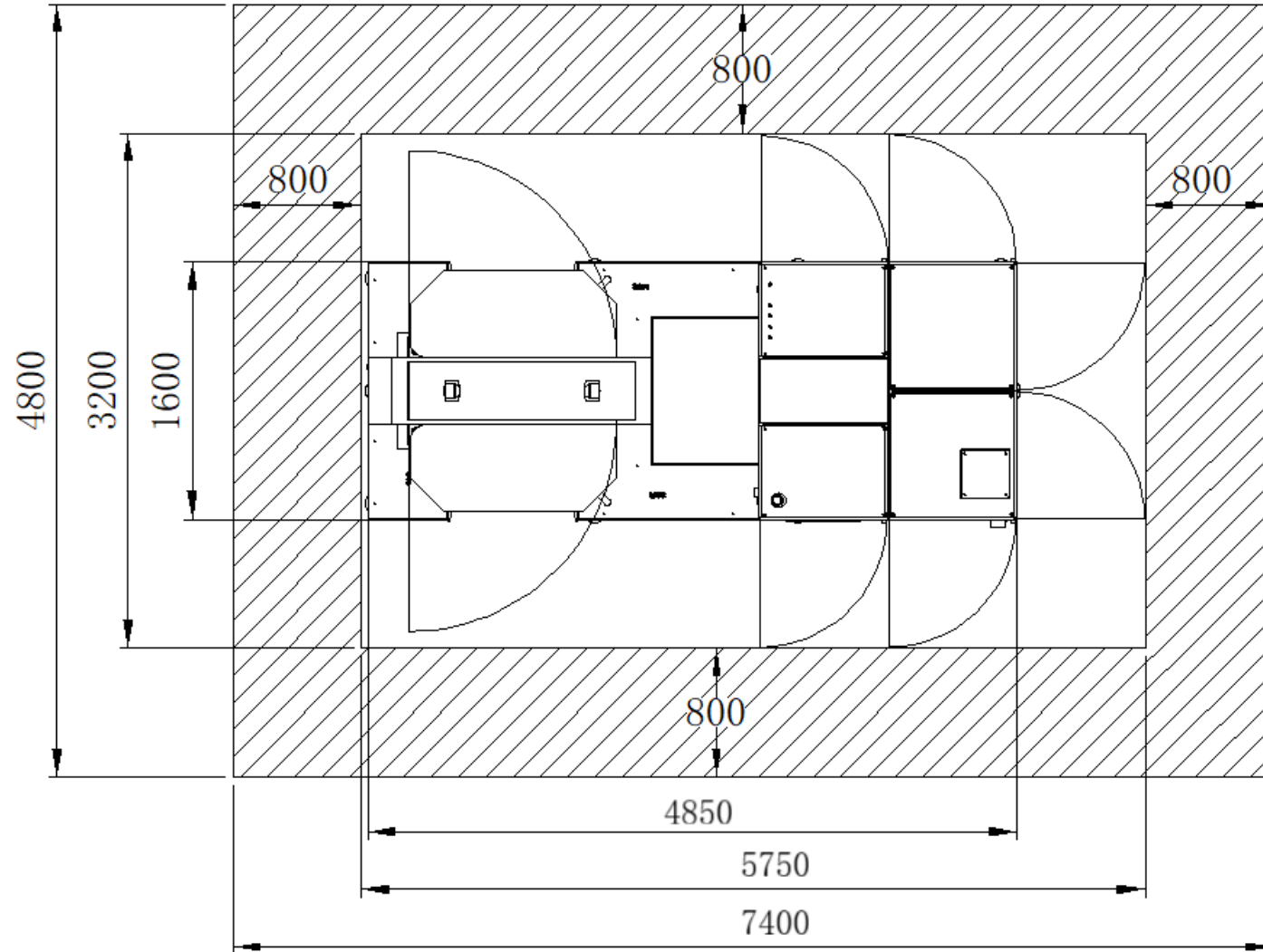
Equipment Parameter



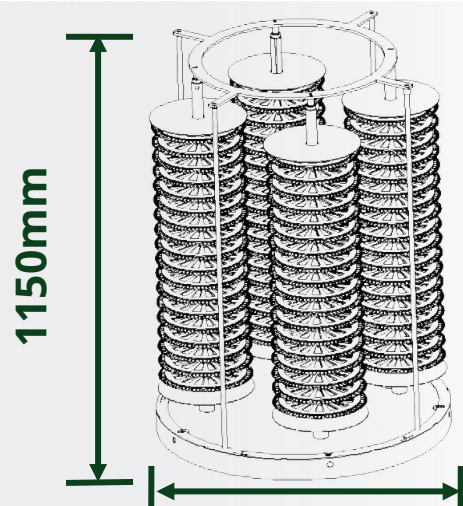
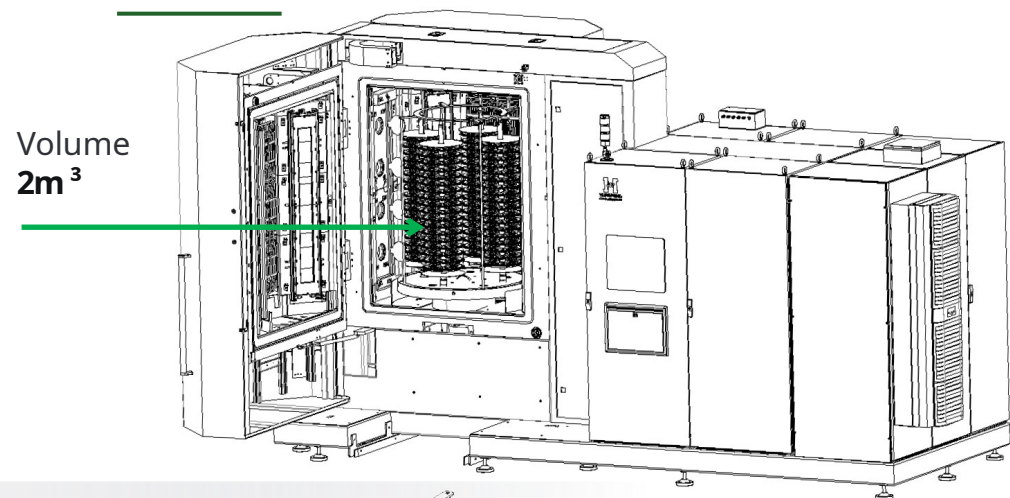
Loading Area



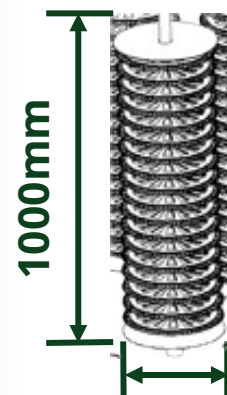
DLC800Space Size



DLC1500/DLC1500PLUSEquipment Parameter



Loading Area
Φ940mm

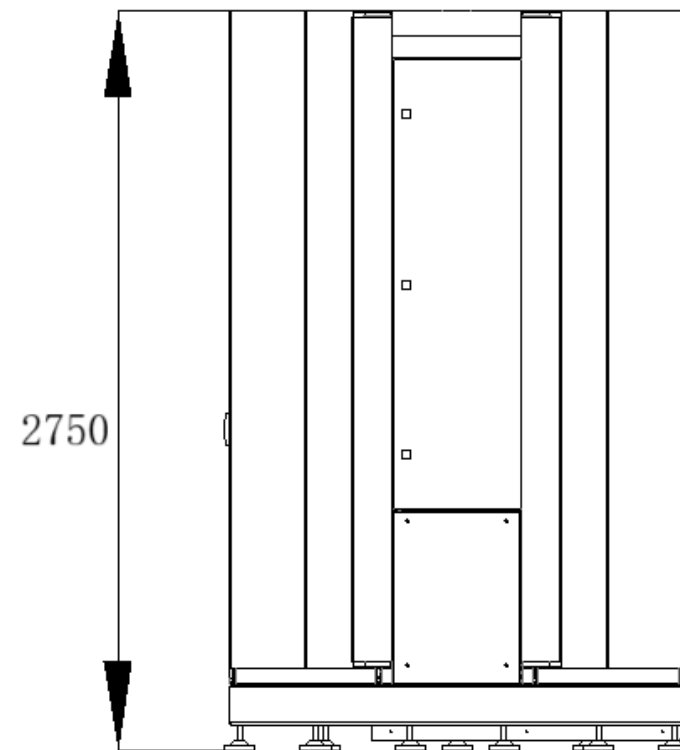
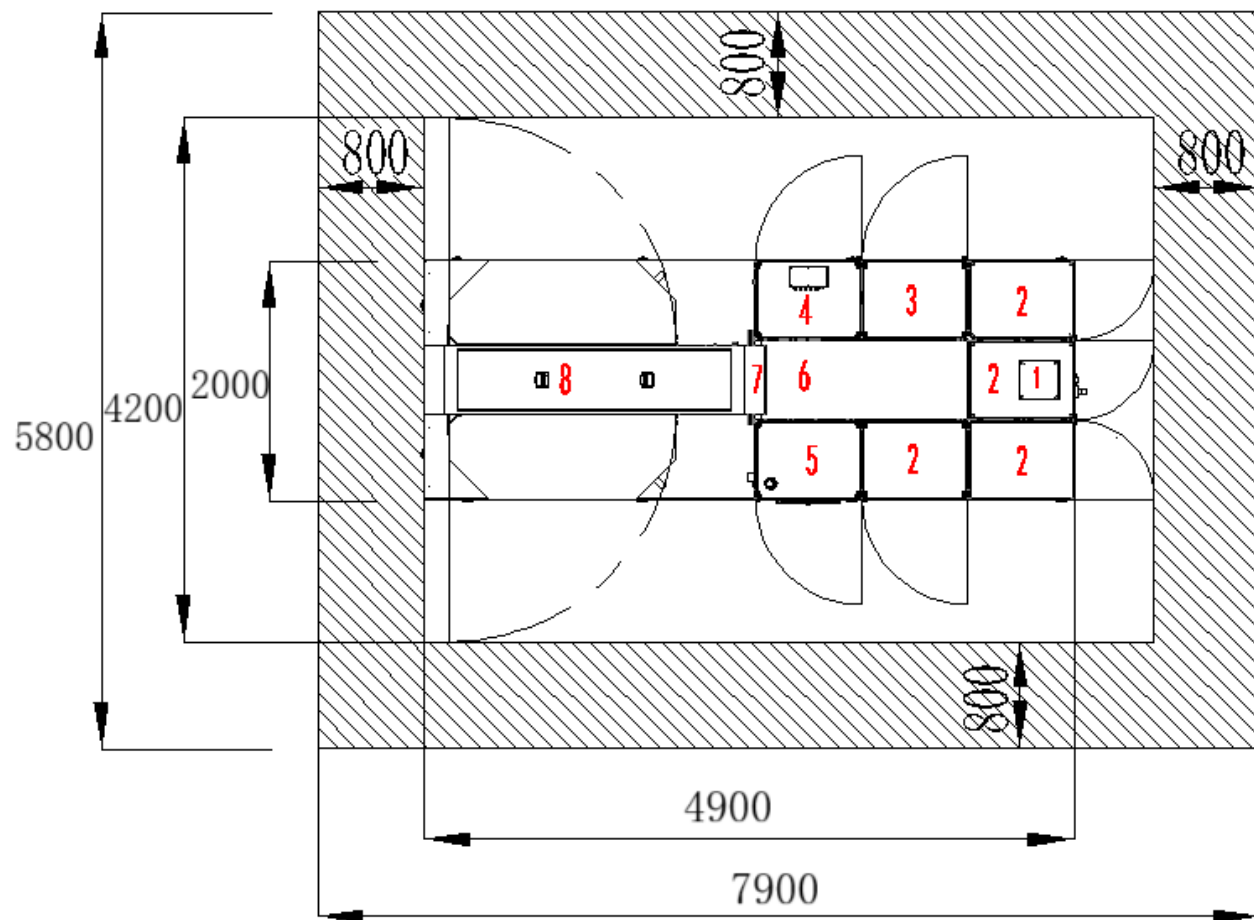


Shaft diameter
largest dimension Φ350

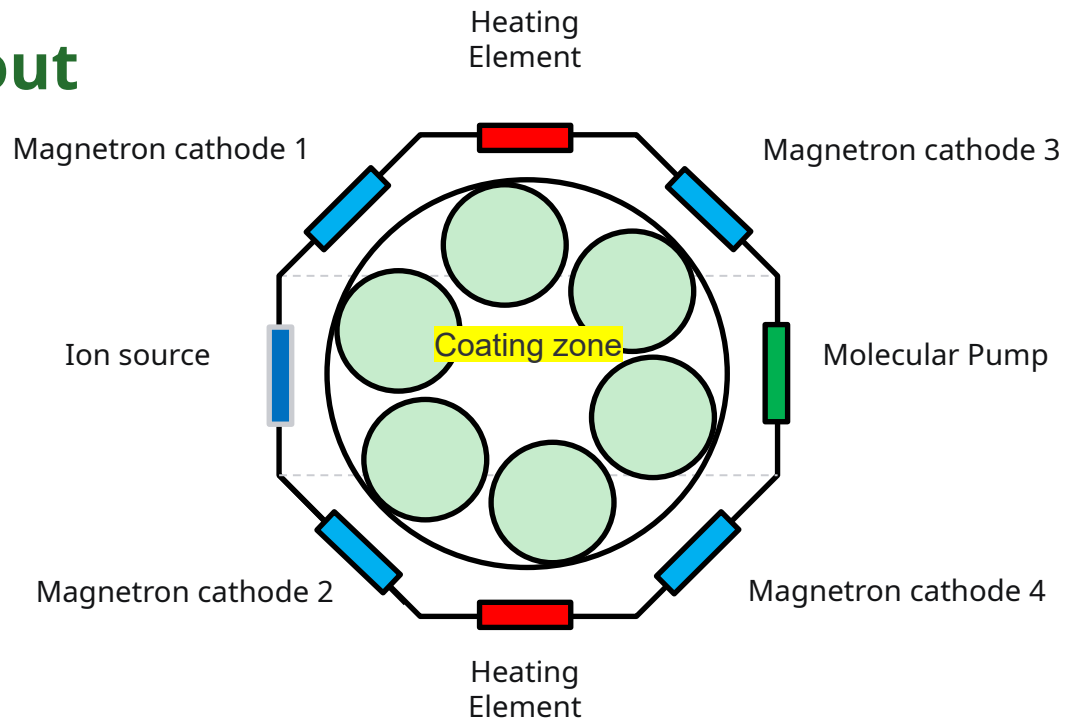
Effective
coating area



DLC1500/DLC1500PLUS Space Size

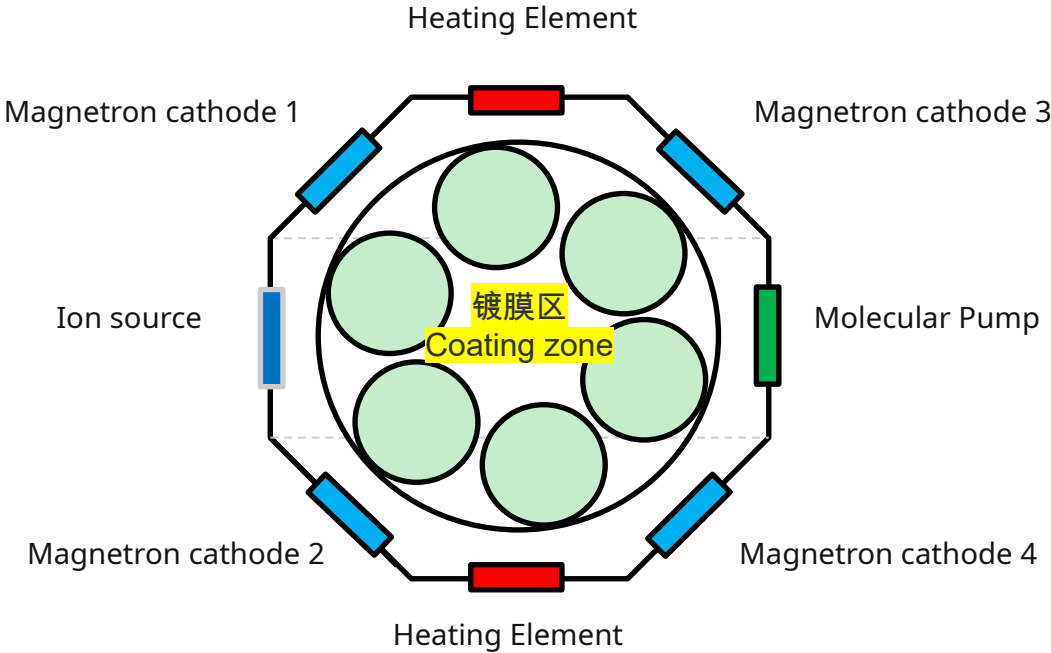


DLC800 Vacuum Structure Layout

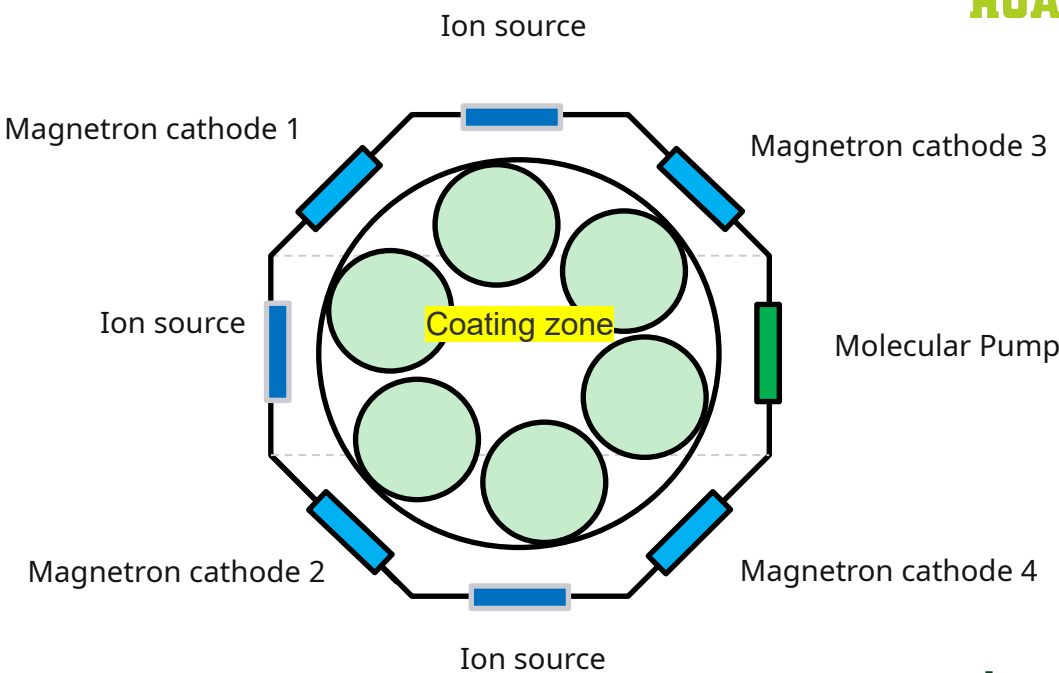


Equipment Model	DLC800
Ion Source (Anion+cation)	1set
Magnetron Sputtering Cathodes (number)	4
Equipment Advantage	Good price, meet the demand to process small quantities of tools

DLC1500/DLC1500PLUS Vacuum Structure Layout



DLC1500 layout



DLC1500PLUS layout

Equipment Model	DLC1500	DLC1500PLUS
Ion Source (Anion+cation)	1 set	1 set
Magnetron Sputtering Cathodes (number)	4	4
Equipment Advantage	High production efficiency, large production, meet the demand to process enormous quantities of tools	High production efficiency, large output, and capable of producing products with complex geometries

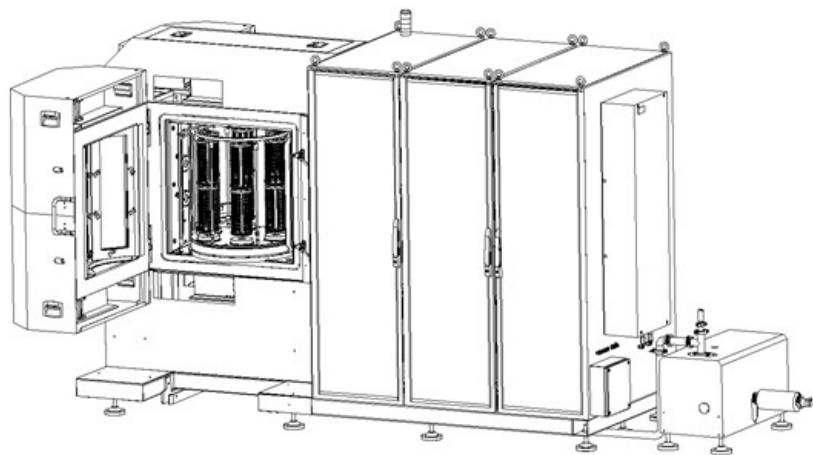
DLC Series Equipment Electrical Parameters

Model	DLC800	DLC1500	DLC1500PLUS
Voltage	3*380/220V (3L+N+PE)		
Current	110A	115A	125A
Power	75kW	80kW	85kW
Frequency	50/60Hz		
Water Cold22~26°C	5-5.5bar		
Compressed air	5-6.5bar		
Process gas : Ar/N ₂ /H ₂ /C ₂ H ₂	1.0-1.2bar		

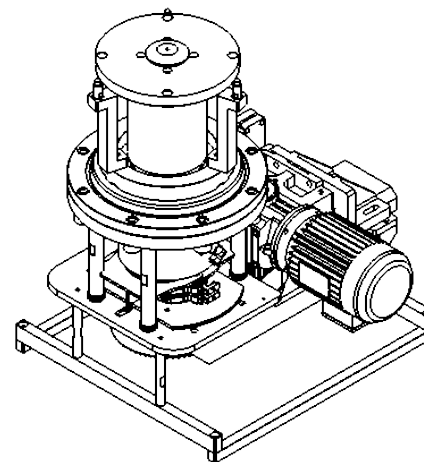
DLC Series Equipment Consumption

Model	DLC800	DLC1500/DLC1500PLUS
Minimum Purity	Ar 99.9992%	
	N ₂ 99.9992%	
	C ₂ H ₂ 99.996%	
	Standard Nitrogen (N ₂) 99.996%	
Consumption per batch	Ar Consumption per batch 50L	Ar Consumption per batch 60L
	N ₂ Consumption per batch 120L	N ₂ Consumption per batch 180L
	C ₂ H ₂) Consumption per batch 10L	C ₂ H ₂ Consumption per batch 12L
	Standard Nitrogen (N ₂) Consumption per batch 100L	Standard Nitrogen (N ₂) Consumption per batch 250L
Cooling water	Max heat discharge 60kW Flow100 L/min (Ullage around 10L/ batch)	Max heat discharge 100kW Flow150 L/min (Ullage around 12L/ batch)
Electric power supply	Average power around 50kW/h About 6h per batch (subject to the process)	Average power around 90kW/h About 6h per batch (subject to the process)

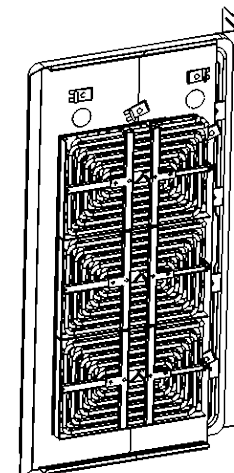
Functional Components



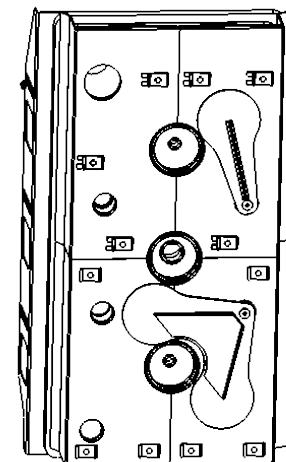
Device main unit



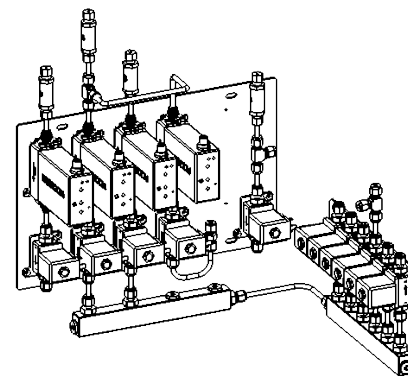
Turntable



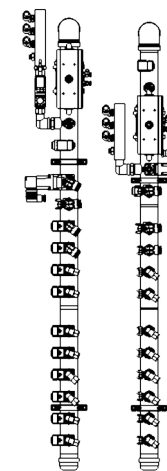
Heating module



Etching module



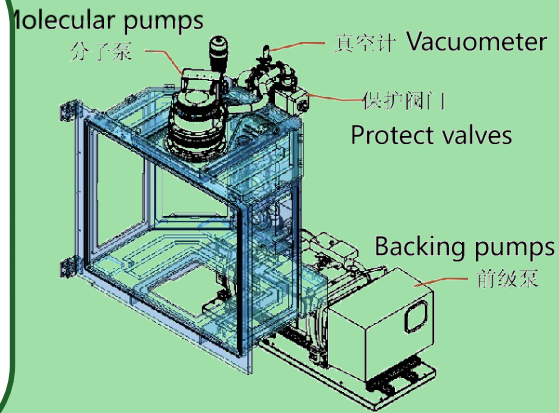
Gas module



Waterway module

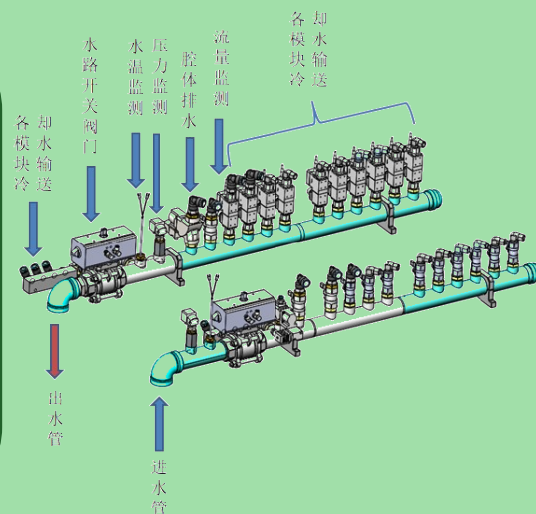
Components and Concepts

Vacuum system



- Pump the vacuum chamber to required vacuum level for coating
- Can choose cavity pressure control mode or flow control mode
- Achieves precise control of gases

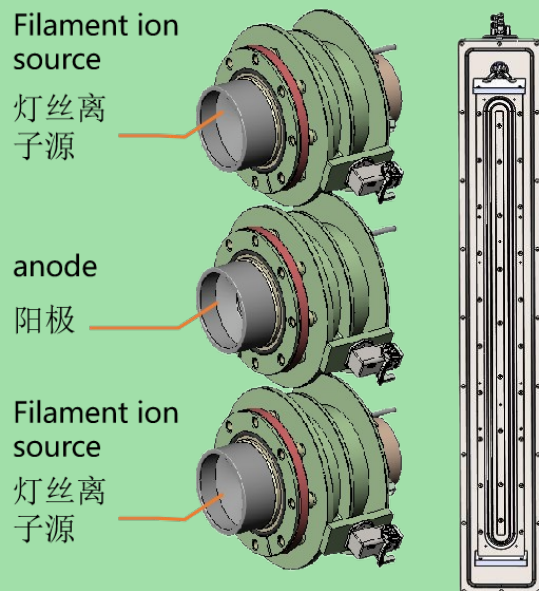
Waterway system



- Provide cooling water for every functional module
- Protect components and seals of each module when working at high temperature
- Each branch monitors flow and temperature individually

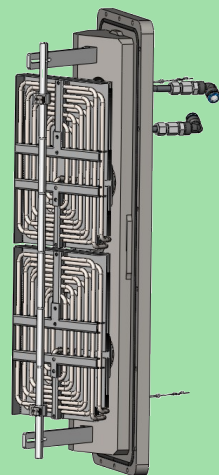
Components and Concepts

Ion source control system



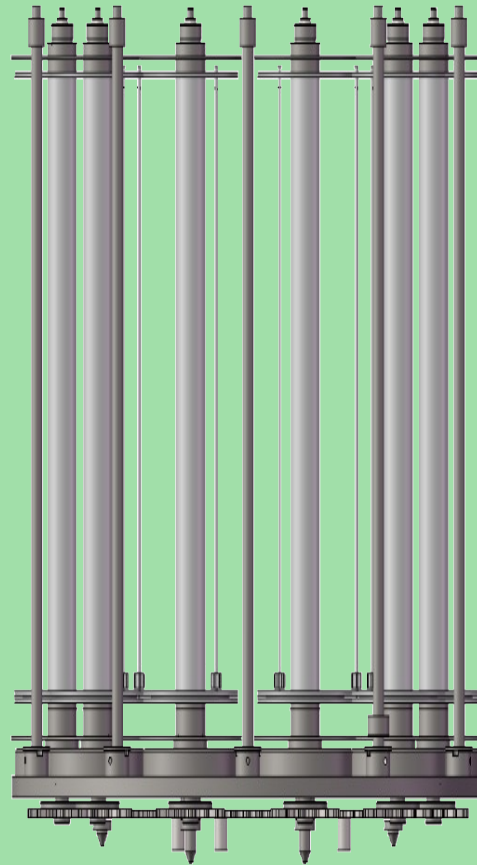
Hot electrons are emitted through the filament to ionized argon. Under the action of negative bias, argon ions accelerate and bombard the workpiece to clean its surface of the workpiece and improve the adhesion of the film layer.

Heater temperature measurement system



Radiation heats the workpiece holder and the product to bake out the gas moisture inside the product structure, allowing precise temperature control of the cavity temperature.

Power transmission and turret



- Driven by a variable frequency motor, it can be continuously adjusted from 1 to 3 rpm
- The spindle adopts magnetic fluid seal
- The turntable achieves the revolution of the disk and the rotation of each tree through gear transmission

Bias power supply

- | | |
|--|---|
| <ul style="list-style-type: none">• Constant voltage output, providing negative bias for turntable. | <ul style="list-style-type: none">• Make the workpiece clean more thoroughly and improve the adhesion of the film layer. |
| <ul style="list-style-type: none">• During etching, argon ions are accelerated to bombard the workpiece surface. | <ul style="list-style-type: none">• By changing the value of negative bias voltage, the film performance can be adjusted. |



Project	Parameter
Voltage	1200V
Power	20kW
Frequency	2~100KHz
Duty cycle	10~100%
Current	66.7A

DLC800 Core Parts List

No.	Part Name	Quantity	Brand	Parameter Description
1	Molecular pump	1	Leybold	pumping speed $2000\text{L}\cdot\text{s}^{-1}$ limit pressure $<10^{-8}\text{mbar}$
2	Backing pump	1	FeiYue	VRD90+VBP600 (two-stage rotary vane pump + Roots pump combination) pumping speed $600\text{m}^3/\text{h}$, limit pressure $1\times 10^{-2}\text{mbar}$.
3	Bias power supply	1	Hüttinger	DC4020, 20kW/set, DC Pulse, DC1200V
4	Cathode	4	Huasheng	Target size $\text{L}500*\text{W}100*\text{T}10\text{mm}$,with baffle to prevent pollution
5	Cathode source power supply	2	Huasheng	30kW 1000VDC
6	Ion source power supply	1	Huasheng	12kW 200A, with baffle for anti pollution
7	Flow meter	4	Azbil	$\text{Ar}/\text{N}_2/\text{C}_2\text{H}_2$

please refer to the technical agreement for latest information

DLC800 Core Parts List

No.	Part Name	Quantity	Brand	Parameter Description
8	Automation system	1	Huasheng	IPC , Beckhoff IPC
9	Cavity	1	Huasheng	Stainless steel material, indirect water cooling
10	Workpiece transmission system	1	Huasheng	Variable frequency motor 1~3r/min , bearing 500KG , magnetic fluid seal
11	Temperature control system	1	Huasheng	20kW heater, PID control
12	1 Vacuum measurement	1	INFICON	Diaphragm Gauge: 1 unit
13	2 Vacuum measurement	4	Pangu	Ionization gauge 1 , Resistance vacuum gauge 3
14	Pneumatic control system	1	AirTAC	Solenoid valve 、 cylinder, sensor
15	Cooling control system	1	NNT	Water temperature, flow sensor, pressure sensor

please refer to the technical agreement for latest information

DLC1500 Core Parts List

No.	Part Name	Quantitiy	Brand	Parameter Description
1	Molecular pump	3	Leybold	pumping speed 2200L·s-1 limit pressure <10-8mbar
2	Plug valve	3	KYKY	Air operated,diameter of openingDN250,leak rate $1.3 \times 10^{-10} \text{Pa} \cdot \text{m}^3/\text{s}$
3	Backing pump	1	FeiYue	VSV-300+VBP-1200 (one-stage rotary vane pump + Roots pump combination) pumping speed 1200m ³ /h, limit pressure $1 \times 10^{-2} \text{mbar}$.
4	Bias power supply	1	Huttinger	DC4020, 20kW/set, DC Pulse, DC1200V
5	Cathode	4	Huasheng	Target size L1200*W100*T10mm,with baffle to prevent pollution
6	Cathode source power supply	2	Huasheng	30kW 1000VDC 30kW 1000VDC
7	Ion source	1	Huasheng	SET Lateral ion source (hot filament), 400A, ,with baffle for anti pollution
8	Flow meter	4	Azbil	Ar/N ₂ /C ₂ H ₂

DLC1500 Core Parts List

No.	Part Name	Quantity	Brand	Parameter Description
9	Automation system	1	Huasheng	Beckhoff IPC 、 PLC,
10	Cavity	1	Huasheng	304 Stainless steel material
11	Workpiece transmission system	1	Huasheng	Variable frequency motor 1~3r/min , bearing 1000KG , magnetic fluid seal
12	Temperature control system	1	Huasheng	24kW heater, PID control
13	Vacuum measurement	1	INFICON /Pangu	Diaphragm gauge *1 , Ionization gauge 1 , Resistance vacuum gauge 3 , Pangu
14	Pneumatic control system	1	SMC	Solenoid valve 、 cylinder, sensor
15	Cooling control system	1	SMC	Water temperature, flow sensor, pressure sensor

* 具体详见技术协议 please refer to the technical agreement for latest information

DLC1500PLUS Core Parts List

No.	Part Name	Quantitiy	Brand	Parameter Description
1	Molecular pump	3	Leybold	pumping speed 2200L·s-1 limit pressure <10-8mbar
2	Plug valve	3	KYKY	Air operated,diameter of openingDN250,leak rate $1.3 \times 10^{-10} \text{Pa} \cdot \text{m}^3/\text{s}$
3	Backing pump	1	FeiYue	VSV-300+VBP-1200 (one-stage rotary vane pump + Roots pump combination) pumping speed 1200m ³ /h, limit pressure $1 \times 10^{-2} \text{mbar}$.
4	Bias power supply	1	Huttinger	DC4020, 20kW/set, DC Pulse, DC1200V
5	Cathode	4	Huasheng	Target size L1200*W100*T10mm,with baffle to prevent pollution
6	Cathode source power supply	2	Huasheng	30kW 1000VDC 30kW 1000VDC
7	Ion source	3	Huasheng	2 sets of anode-layer ion sources; 1 set of side-mounted hot-filament ion source, 400 A, with protective shutters to prevent contamination.
8	Flow meter	5	Azbil	Ar/N ₂ /C ₂ H ₂

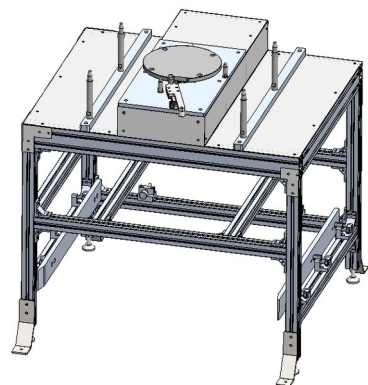
DLC1500PLUS Core Parts List

No.	Part Name	Quantity	Brand	Parameter Description
9	Automation system	1	Huasheng	Beckhoff IPC 、 PLC,
10	Cavity	1	Huasheng	304 Stainless steel material
11	Workpiece transmission system	1	Huasheng	Variable frequency motor 1~3r/min , bearing 1000KG , magnetic fluid seal
12	Temperature control system	1	Huasheng	24kW heater, PID control
13	Vacuum measurement	1 set	INFICON /Pangu	Diaphragm gauge *1 , Ionization gauge 1 , Resistance vacuum gauge 3 ↑ , Pangu
14	Pneumatic control system	1	SMC	Solenoid valve 、 cylinder, sensor
15	Cooling control system	1	SMC	Water temperature, flow sensor, pressure sensor

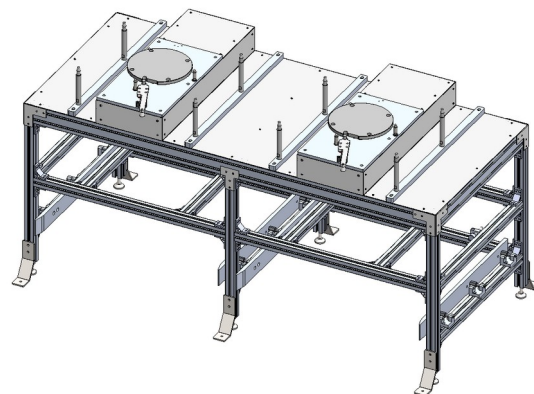
*please refer to the technical agreement for latest information

Optional Accessories

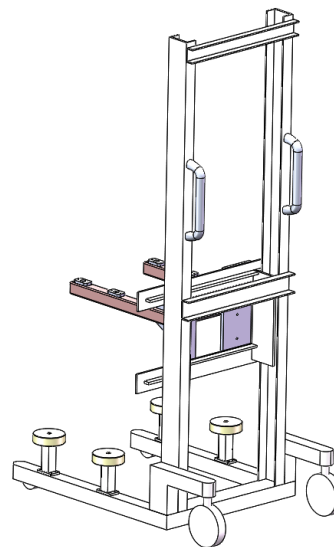
- Work bench for one operator



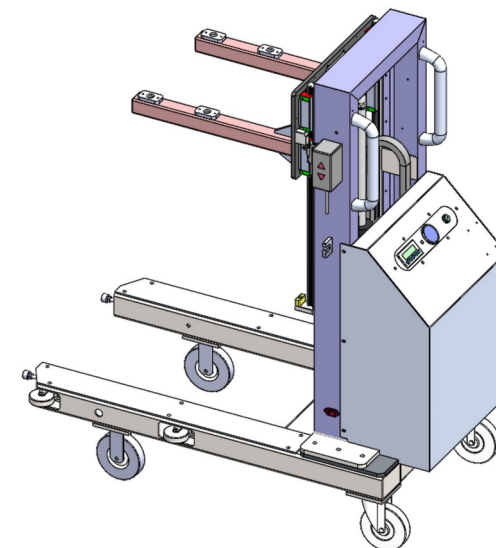
- Work bench for two operators



- Forklift for loading and unloading carousel (manually operated)



- Forklift for loading and unloading carousel (semi-automatic mode)



04

DLC Series Equipment Process & Application

100 μ m

内圈直径: 6.288mm
外圈直径: 6.768mm
物镜倍数: 3,000
涂膜厚度: 3.7 μ m

SuPro
Instruments

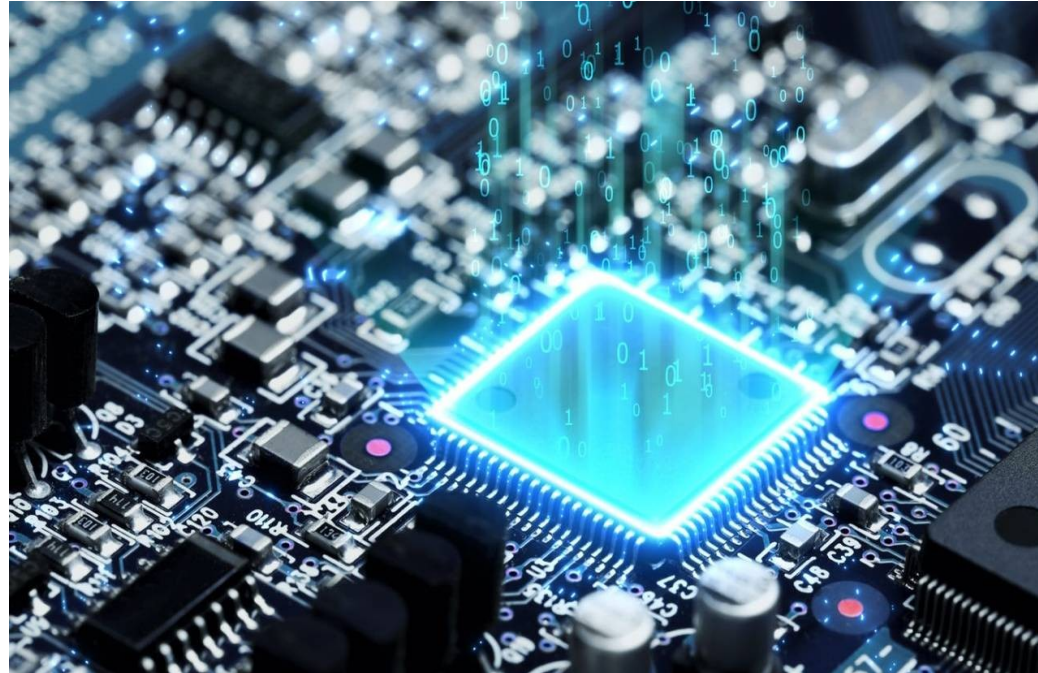
Indentation adhesion strength HF1/HF2 level

PVD Coating Application in Semi-conductor

Huasheng plasma coating —wear-resistant, anti-corrosion and high-hardness coating, extending product service life and improving stability and durability of parts.



Part: Star wheel
Coating : DLC



Part: Semiconductor
nozzle
Coating: oxide coating



Part: Etching Cavity
Coating
Coating: Anti-ion etching
coating

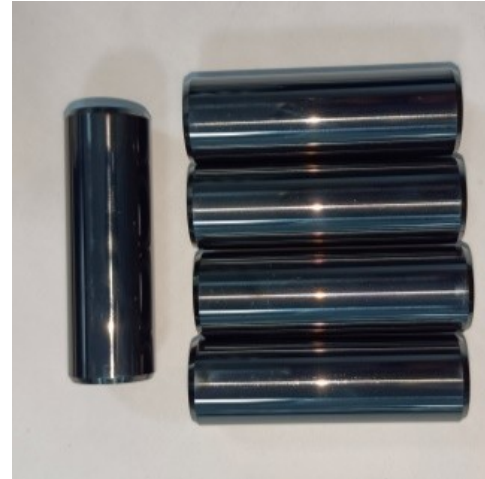
PVD Coating Application in Fuel Vehicle

Huasheng DLC coatings increase the surface hardness & wear resistance of parts and extend the service life of parts.

Car engine



Piston pin



Plunger piston



Piston ring



Valve



Exhaust cam shaft

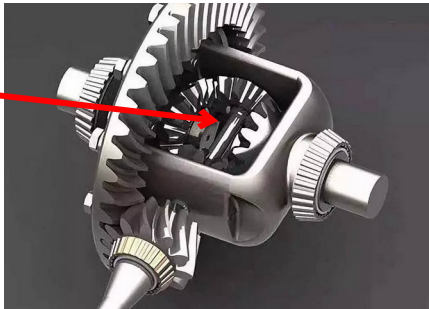
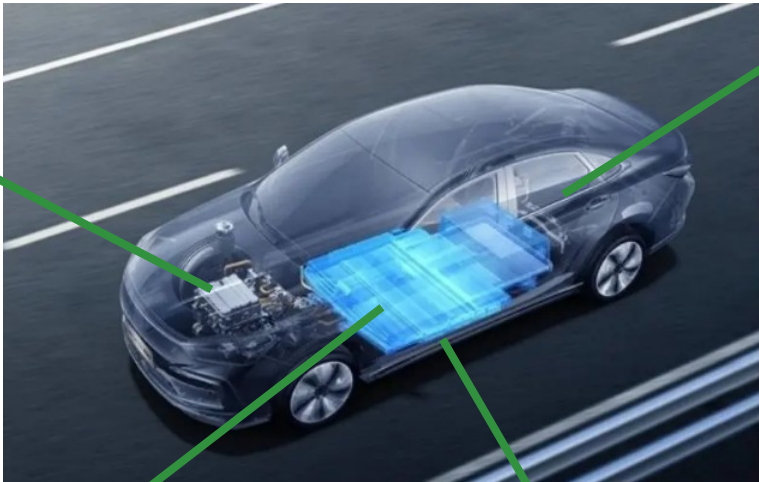
PVD Coating Application in New-Energy Vehicles



Air conditioning water pump motor



DLC Motor Shaft



Differential



DLC coating straight shaft



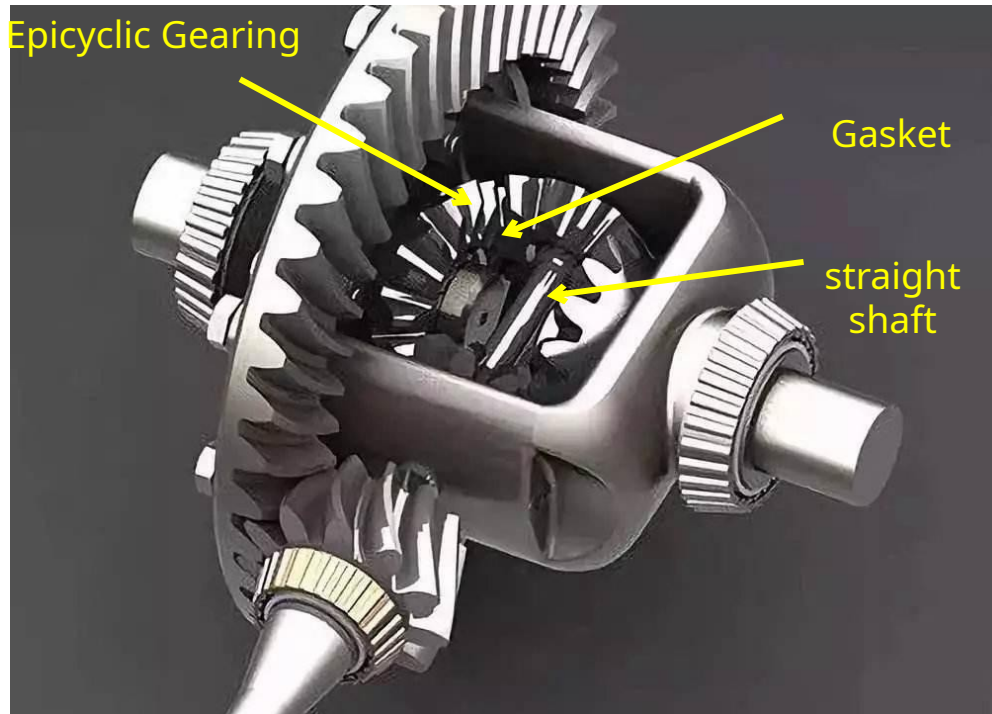
DLC grinding head in Lithium battery coater



Lithium battery winding machine DLC Rolling needle

PVD Coating Application in New-Energy Vehicles

- New energy vehicles are 25%-50% heavier than traditional fuel vehicles
- High rotation speed (6000-10000rpm)
- High acceleration (4-7s/100 km)



Differential structure

Advantages of DLC coating :

- Low friction coefficient, smooth
- reduce noise
- High hardness, wear-resistance
- Excellent thermal conductivity, less risk of ablation



Differential parts after DLC coating

PVD Coating Application in New-Energy industry



Lithium battery coater



Die



Operating status of Coater

Requirements of die coating :

- High wear-resistance
- Low roughness
- Anti-corrosion



Die after DLC Coating

PVD Coating Application in Textile Industry



Auxiliary nozzle



Steel collar



mooth Shaft



Reed blade



Rotating Shuttle



Needle bar



Crochet hook

PVD Coating Application in Machinery Industry

Huasheng DLC coating with close hardness as diamond increases the wear-resistance, smooth performance of parts, avoids strain, reduce the damage of parts and extends the life span of parts.



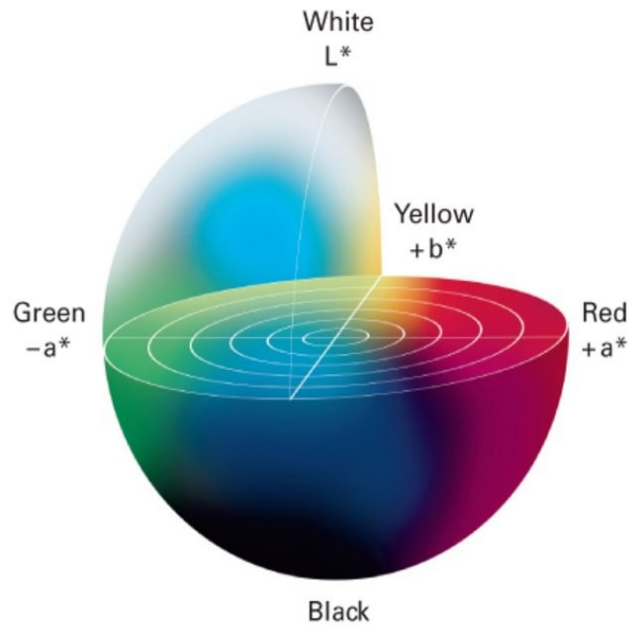
Part: Bearing ring
Coating : DLC



Part: impulse piston
Coating: DLC

PVD Coating Application on Consumer Goods Industry

- The decorative coating are important for fashion-driven consumer goods and decorative products to win the market, including products with fast-rotation feature (usually are luxury goods), or products in long-time usage such as bathroom hardware devices (water tap and showers), car interior decoration products, and door handles, etc.



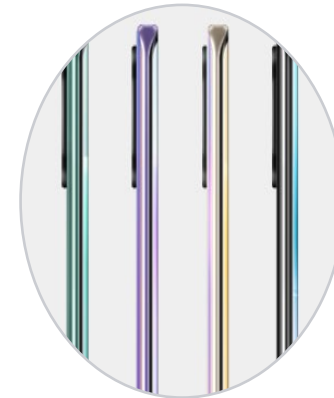
Watches, smart wearables product



Household appliances

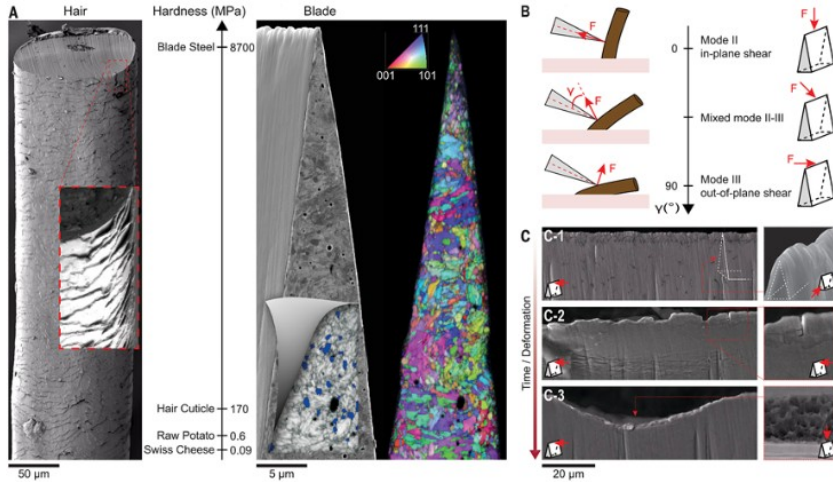


Shaver

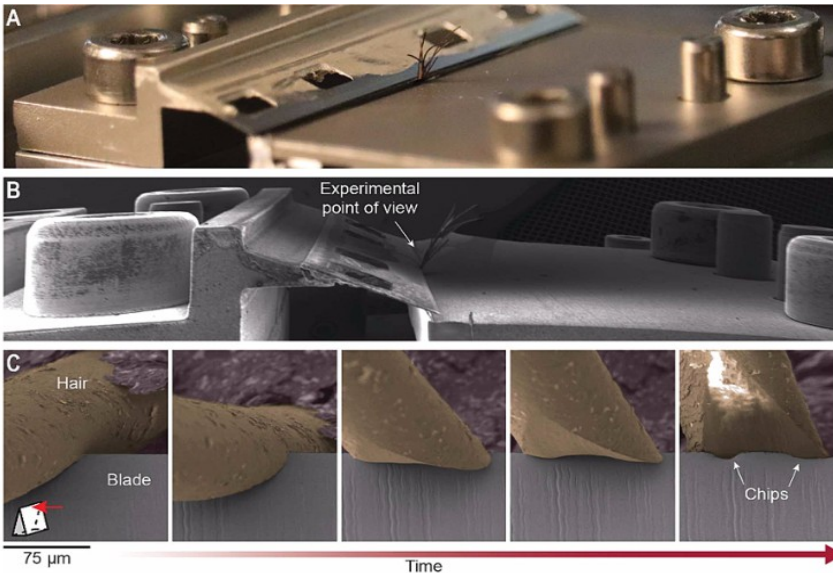


3C products decoration

PVD Coating Application in Consumer Goods Industry



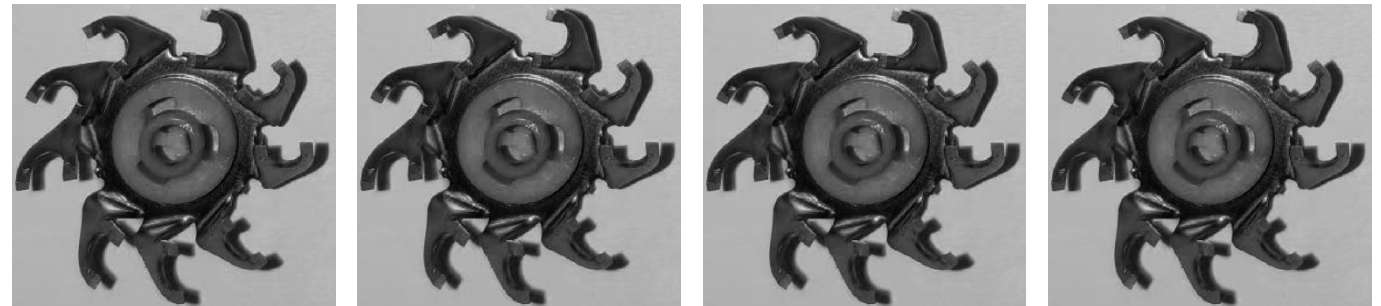
Microstructure of beards and razor blade



Process characterization of beard cutting



Uncoated shaving heads



Shaving heads after coating

- ✓ 24-hour salt spray test on high-speed steel substrate
- ✓ Maintain low friction coefficient > 200 hours



Your Ideas, Our Solution

THANKS