

# PRINCETON SCIENTIFIC

C O R P O R A T I O N ®

**SOLUTIONS FOR**  
RESEARCH, DEVELOPMENT  
& PRODUCTION

[www.princetonscientific.com](http://www.princetonscientific.com)



## MATERIALS

Leading supplier of advanced materials for research, industrial, and laboratory applications.

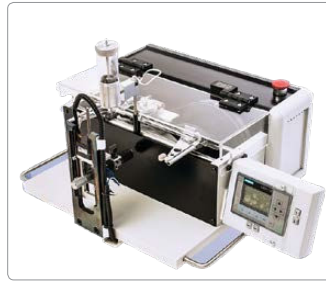
- Metal Single Crystals & Bicrystals
- Highest Purity Materials
- Oxide Single Crystals
- Evaporation Materials
- Thin Film Materials
- Sputtering Targets
- Backing Plates
- Optical Materials
- NLO/Laser Crystals
- Monocrystalline: Sapphire, Quartz
- Undoped Garnets: YAG, GGG
- Re-polishing & orienting of customer's samples
- Bonding
- Fluorides
- Chlorides
- Infrared



## TENSIOMETERS

Pioneering smartphone-based technology with precise surface measurements in a compact device.

- With automatic or manual dropper
- Accurate contact angle, surface tension, surface energy, and sliding angle measurements
- Effortless setup
- Intuitive operation
- Dynamic Sessile Stage
- Hamilton Syringe with threaded plunger ensures precision in drop generation



## WIRE SAWS

Wire saws for cutting semiconductors, ferrites, metals, glasses and other hard or brittle solids, using two different methods: wet and dry cut.

- Cut surfaces of nearly "lapped" quality
- Minimal loss of material
- Cutting that does not introduce deformations
- Wire diameters from 20  $\mu\text{m}$  to 60  $\mu\text{m}$
- No "wandering" of cutting wire in an unintended direction
- Cut samples up to a size of 80x80x150 mm
- Semi-automatic, requires no supervision



## UHV TECHNOLOGY

A wide selection of vacuum products & equipment for the research community and high tech industry which include:

- Manipulators
- Drives and Motions
- UHV Chambers
- UHV Valves & Accessories
- Components



## VACUUM SYSTEMS

We offer comprehensive turnkey solutions for vacuum systems, along with custom engineering services.

- Bell-Jar Type Thermal Systems
- Thermal Evaporator Systems
- Thermal & Sputter Combined Systems
- Magnetron Sputtering Systems
- High-Power Sputtering Systems
- E-Beam Systems
- PECVD Systems
- Space Simulator Systems
- Load-Lock Equipped Coating Systems
- Glove-Box Adapted Vacuum Systems
- Vacuum Furnace & Bake-Out Systems



## PARTICLE BEAM LINE

Our areas of expertise include beamline systems, beam diagnostic devices for research, industrial, and commercial accelerator systems.

- Vacuum Technology
- Particle Accelerators
- Beam Diagnostics
- Faraday Cups
- High Vacuum Feedthroughs
- Metal-Ceramic Bonds
- Beam Stopper
- RFQ Accelerator Structures
- Variable Segmented Aperture
- Jaw Slit Systems
- Rotating Wire Scanner



## PLASMA TECHNOLOGY

Extensive range of Vacuum Plasma Systems and Supporting Equipment

- DC Power Supplies
- RF Generators
- Plasma Cleaners
- Magnetron RF & DC Sputtering Sources
- Automatic Matching Network
- Glovebox Systems



## DESKTOP COATERS

Elevate your research and production processes with our state-of-the-art precision vacuum coating systems.

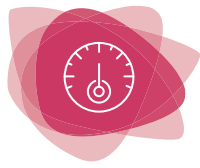
- Sputter Coaters
- Carbon Coaters
- Turbo-pumped Coaters
- Thermal Evaporation Coaters
- PLD & Thermal Evaporation Systems
- Vacuum Coaters for glovebox

# About Princeton Scientific Corporation

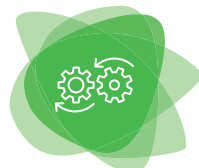
Founded in 1991, Princeton Scientific Corp. is a worldwide supplier of material science & engineering related products, plus particle beam line technology, wire saws, UHV technology and plasma technology for scientists, engineers, and industrial manufacturers.



**MATERIALS**



**TENSIOMETERS**



**WIRE SAWS**



**UHV  
TECHNOLOGY**



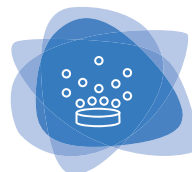
**VACUUM  
SYSTEMS**



**PARTICLE  
BEAM LINE**



**PLASMA  
TECHNOLOGY**



**DESKTOP  
COATERS**



**ADDITIONAL  
SERVICES**

We have an excellent and long-standing reputation for Metallic Single Crystals, Sputtering Targets, Superconductor substrates, Laser Crystals, Optical Materials, Opto-Electronic Components, and various Oxide Crystalline Materials within the scientific community.

Not only do we offer crystal boules, blanks, semi-finished and finished products in the form of wafers, windows, lenses, prisms, tubes, rods and crucibles, but also cutting and polishing services for such materials. In addition to materials, we also offer Precision and Diamond Wire Saws, Particle Beam Line & Diagnostics, UHV Technology, Vacuum Systems and Plasma Technology.

## Princeton Scientific Corp. offers:

- **Precision & Diamond Wire Saws**
- **Particle Beam Line & Diagnostics**
- **Vacuum Systems**
- **UHV Instruments & Components**
- **Tensiometers**
- **Desktop Coaters**
- **Instruments & Electronics for Plasma Technology**

All of these devices are designed and built to the highest quality standards.

# SPUTTERING TARGETS

Princeton Scientific Corp. offers sputtering targets made of metals, non-metals and chemical compounds with purities ranging from 99.9% to 99.9999%.

We offer standard, single element, pure metals and custom compounds. We also have various geometric shapes; round, rectangular, as well as multi-tile and stepped constructions are possible.

Please review our standard and specialty target list for more information. Princeton Scientific can produce sputtering targets to your specific needs. We will help to select appropriate target material, fabrication process, and bonding assembly that ensures the success of your thin film deposition process. Our sputter targets are prepared either by a melt or a powder metallurgical process.

We also provide an assorted array of backing plates for your systems requirements. Also, our bonding services include various metallic or silver epoxy techniques.



BORIDES	CARBIDES	FLUORIDES	NITRIDES	SILICIDES
CrB2	B4C	AlF3	AlN	CrSi2
HfB2	Cr3C2	BaF2	BN	Cr3Si
LaB6	HfC	CaF2	HfN	HfSi2
Mo2B6	Mo2C	CeF3	NbN	MoSi2
NbB2	NbC	LaF3	Si3N4	NbSi2
TaB2	SiC	PbF2	TaN	PtSi
TiB2	TaC	LiF	TiN	TaSi2
WB	TiC	MgF2	VN	Ta5Si3
W2B	WC	KF	ZrN	TiSi2
VB2	WC 6%Co	Re/NaF	and others	Ti5Si3
ZrB2	WC 12%Co	Na3AlF6		WSi2
and others	VC	ThF4		VSi2
	ZrC	YF3		V3Si
	and others	and others		ZrSi2
				and others

SULFIDES / SELENIDES / TELLURIDES				
As2S3	PbS	NbSe2	TaTe2	ZnS
CdSe	PbTe	Nb-S	WSe2	ZnTe
CdS	MoSe2	NbTe2	WS2	and others
CdTe	MoS2	TaSe2	WTe2	
PbSe	MoTe2	TaS2	ZnSe	



### METALS

Aluminium	Chromium	Lead	Platinum	Tantalum
Antimony	Cobalt	Lithium	Potassium	Tellurium
Barium	Gallium	Magnesium	Rhenium	Tin
Beryllium	Germanium	Manganese	Rhodium	Titanium
Bismuth	Gold	Molybdenum	Rubidium	Tungsten
Boron	Hafnium	Niobium	Ruthenium	Vanadium
Cadmium	Indium	Nickel	Selenium	Zinc
Calcium	Iridium	Osmium	Silicon	Zirconium
Carbon	Iron	Palladium	Strontium	

### RARE EARTH

Cerium	Gadolinium	Neodymium	Terbium	Various Rare
Dysprosium	Holmium	Praseodymium	Thulium	Earth Alloys
Erbium	Lutetium	Samarium	Ytterbium	
Europium	Lanthanum	Scandium	Yttrium	

### ALLOYS

Al/B	Au/Pd	Co/Ni	Ge/Si	Pt/Ru
Al/Cu	Au/Pt	Co/Ta/Zr	Ge/Te	Pt/Ag
Al/Cu/Si	Au/Sn	Cr/SiO2 Cermet	In/Sn	Sb/In
Al/Cr	Au/Zn	Cu/Al	Ir/Mn	Sb/In/Sn
Al/Li	Bi/Sb	Cu/Cr	Ni/Cr	Si/Al
Al/Mg	Bi/Sb/Se	Cu/Ga	Ni/Fe	Si/Cr
Al/Si	Bi/Sb/Se/Te	Cu/Ni	Ni/Ti	Ta/Ti
Al/Ti	Bi/Sb/Te	Cu/Sn	Ni/V	Ti/Al
Au/Sb	Bi/Se	Fe/Al/Si	Ni/Zr	Ti/W
Au/Ag	Bi/Te	Fe/Cr	Os/Ru	Ti/Zr
Au/B	Cd/Te	Fe/Mn	Pb/Se	W/Ti
Au/Be	Co/Cr	Fe/Ru/Ga/Si	Pb/Te	Zn/Al
Au/Ge	Co/Fe	Fe/Si	Pb/Se/Te	Zr/V
Au/Ir	Co/Nb/Zr	PFe/Si/B/C	Pd/Pt	and others

### OXIDES

Al2O3	CuO	PbZrO3	Supercond.	Y2O3
Sb2O3	HfO2 unstab.	LiNbO3	SrO	ZnO
BaTiO3	HfO2/CaO	MgO	SrTiO3	ZnO dop.
Bi2O3	HfO2/Y2O3	MoO3	SrZrO3	ZrO2 unstab.
Bi2TiO5	In2O3	Nb2O3	Ta2O5	ZrO2/CaO
Bi4Ti3O12	ITO	Nb2O5	ThO2	ZrO2/Y2O3
BiTiO3	LaAlO3	Re2O3	SnO2	and others
CeO2	La2O3	SiO2	TiO2	
CrO3	PbTiO3	SiO	WO3	

## Backing Plates

Backing plates are available in the following materials:

- Copper
- Stainless Steel
- Aluminum
- Molybdenum
- Invar
- Kovar

# EVAPORATION MATERIALS

Princeton Scientific Corp. provides a wide variety of evaporation materials for the vacuum deposition industry. Our materials are available in various purities ranging from 99.9% to 99.9999%.

Evaporation material can be made to order in the following forms:

- **Chunk**
- **Foil**
- **Pellet pieces**
- **Wire**
- **Rod**
- **Shot**
- **Slug**
- **Starter**
- **Source**
- **Tablet**
- **Granules**



## EVAPORATION MATERIALS

Al	Ca	Eu	La	Ni	Ag	TiO
AlSb	CaF2	Eu2O3	LaAlO3	Ni2B	AgCl	TiN
AlB2	CaH2		LaB6	NiSi2	Ag2O	Ti2O3
AlF3	CaO	Gd	La2O3	NiO		TiSe2
Al2O3	CaS	Gd2F3	(La0.7Sr0.3)MnO3	NiTe	Na	TiSi2
AlP	CaTiO3	Gd3Ga5O12	LaTiO3		Na5Al3F14	
	Ca3(PO4)2		Pb	Nb	Na2CO3	W
Sb	Ca10(OH)2(PO4)6	Ga	PbO	NbC	NaCl	WC
Sb2S3		GaSb	PbTe	Nb2O5	NaF	WO3
Sb2O3	C	GaAs		NbO2	Na2O2	WSe2
Sb2Te3		GaN	Li	NbSe2		WSi2
	Ce	Ga2O3	Li2CO3		Sr	WS2
As	CeB6		LiCoO2	Os	SrCO3	WTe2
As2O3	CeF3	Ge	LiF		SrF2	
As2Te3	CeO2	Ge3N4	LiMn2O4	Pd	SrMoO4	V
		GeO2	LiNbO3	PdO	SrO	VC
BST	CsF	GeSe2	Li2O	P	SrRuO3	VO2
BaS	CsI	GeS	Li3PO4	P2O5	SrS	VN
BaZrO3		GeTe			SrTiO3	V2O3
Ba	Cr		Lu		SrZrO3	V2O5
BaFe12O19	CrO3	Au	Lu2O3	Pt		VSe2
BaF2	CrB2				S	V2S3
BaO	Cr3C2	Hf	Mg	KNbO3		
BaO2	CrF3	HfC	MgAl2O4		Ta	Yb
BaTiO(3)	Cr2N	HfO2	MgB2	Pr	TaC	YbF3
	Cr2O3		MgF2	Pr2O3	TaN	Yb2O3
Bi	CrSi2	Ho	MgO		Ta2O5	
Bi2O3	Cr2S3	Ho2O3	Mg2Si	Re	TaSe2	Y
Bi2S3			MgS		TaSi2	Y3Al5O12
Bi2Te3	Co	In		Rh		Y3Fe5O12
Bi4Ti3O12	CoFe2O4	In2Te3	Mn	Rh2O3	Te	YF3
	CoO	InSb	MnO		TeO2	Y2O3
B	Co3O4	InN	MnO2	Ru		
B4C	CoSi2	In2O3	Mn2O3	RuO2	Tb	Zn
BN		In2O3/SnO2	MnTe		TbF3	ZnF2
B2O3	Cu	Ir	HgTe	Sm	TbOF	Zn3N2
	CuS	IrO2		SmF3	Tb4O7	ZnO
Cd	Cu2O			Sm2O3		Zn3P2
Cd3As2	CuO		Mo		Sn	ZnSe
CdCl2	Cu3P	Fe	MoB	Sc	SnF2	ZnS
CdF2	CuSe	FeB	MO2C	Sc2O3	SnO2	ZnTe
CdO	Cu2S	Fe3C	MoS2		SnS2	
CdSe		NiFe2O4	MoO3	Se	SnTe	Zr
Cd2SnO4	Dy	Fe2O3	MoO2	SeO2		ZrB2
CdS	DyF3	Fe3O4	MoSe2		Ti	ZrC
CdTe	Dy2O3	FeSi2	MoSi2	Si	Ti3Al	ZrCl4
		FeS2	MoTe2	SiC	TiB2	ZrF4
	Er			SiO2	TiC	ZrN
	ErF3		Nd	SiO	TiO2	ZrO2
	Er2O3		Nd2O3	Si3N4	TiF3	ZrSi2
				SiS2		ZrO2/Y2O3

# LASER CRYSTALS



We offer common host crystals such as YAG (Yttrium aluminium garnet) or YVO4 (Yttrium orthovanadate) with various dopants such as Neodymium, Ytterbium, Erbium and Chromium. The ready to use (coated) or uncoated laser rods are manufactured to the highest standards of our crystal technology.

All of the laser components' AR coatings are optimized for high power lasers and are available for the wavelength range from 193 nm to 3000 nm.

Both the bandwidth (depending on the wavelength) and the effectiveness of the coating can be influenced by the various designs and different coating materials. Thus the optimal coating for each application can be made available.

Custom sizes, polished, unpolished, coated and uncoated crystals are available upon request. Please provide us with your detailed specs or drawing so we can provide our most competitive offer.



KTO  
KTA  
KDP  
BBO

LiNbO3  
LiTaO3  
Cr:YAG  
MgO:LiNbO3

## YAG CRYSTALS

Er:YAG  
Nd:YAG  
Yb:YAG  
Cr, Tm, Ho:YAG

## YLF CRYSTALS

Ho:YLF  
Nd:YLF  
Tm:YLF  
Er: YLF

## YSGG CRYSTALS

Er:YSGG  
Er,Cr:YSGG  
Cr,Nd:YSGG  
Cr,Tm,Ho:YSGG

## YAP CRYSTALS

Er: YAP  
Nd: YAP  
Tm: YAP

## OTHER

Alexandrite  
Ti: Sapphire  
Forsterite  
Nd: YV04, Diffusion bonded crystals



# METAL SINGLE CRYSTALS

**Application:** Metal single crystals are required for basic research (surface physics, catalytic chemistry, investigation of material properties), for monochromators (X-ray, neutrons) and electrons (W-needles, LaB6, CeB6).

**Properties:** The quality of our crystals is characterized by an especially high mosaicity. Metallic single crystals are produced using state-of-the-art equipment that meets the highest quality standards. Crystal growth by Bridgman, Czochralski, and zone melting techniques relies exclusively on the highest-purity starting materials.

**Geometric:** Several geometries are available. See our website for all geometries we offer. When requesting a quote, please specify geometric shape. In case the desired geometrics are not available on our website, please send us a drawing.

**Mosaicity of the elements:** The mosaicity describes the deviation of the perfect structure of the crystal. It is the angle specification which describes the deviation of a reflective X-ray jet and the ideal reflex angle. A small angle stands for a perfect crystal structure.



During application of the surface, particular emphasis will be put on orientation accuracy of the crystallographic direction. **Orientation accuracy:** up to  $<0,05^\circ$ .

The especially careful surface conditioning (polishing) allows, after low heat and sputter cycles, the direct investigation of up to several 1000 nm spread nuclear terraces. **Polishing:** roughness  $< 1$  nm (also with soft elements like Au or Pb).

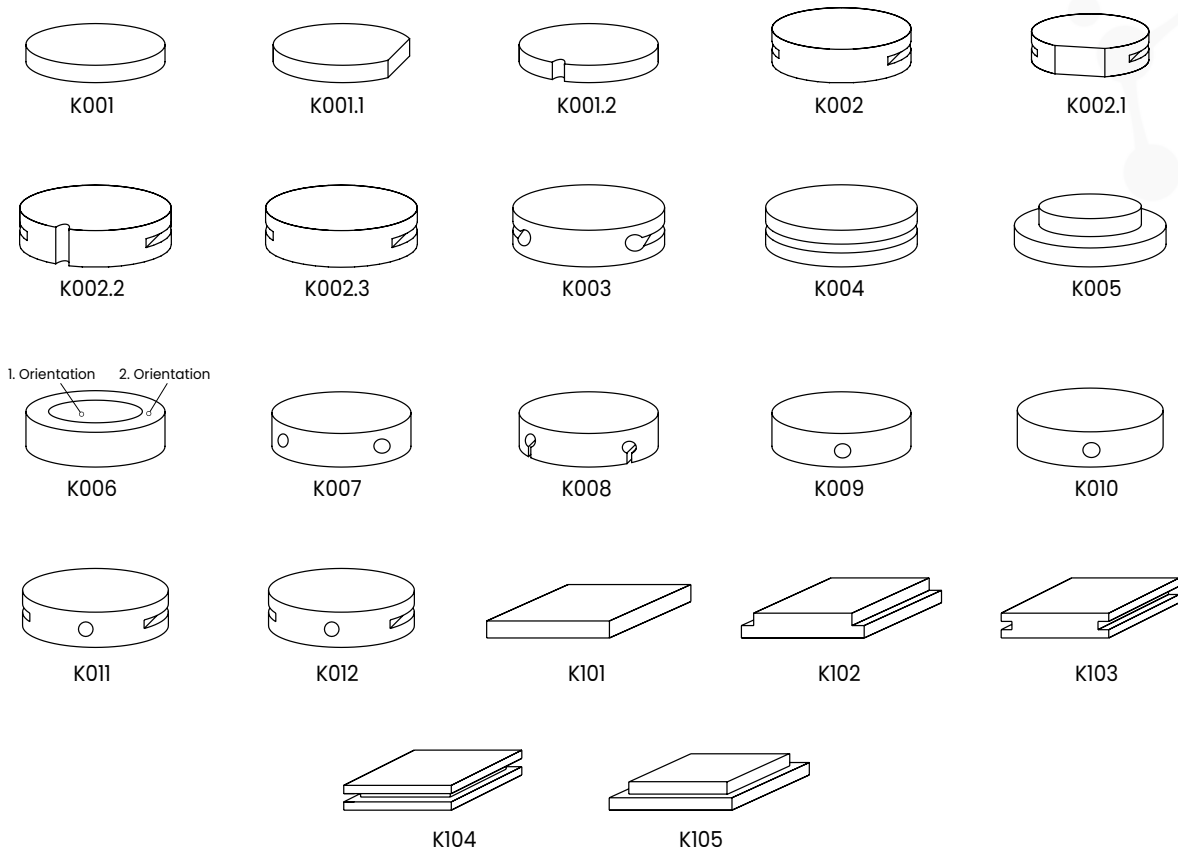
13 26.982 <b>Al</b> Aluminium Purity 6N	51 121.76 <b>Sb</b> Antimony Purity 6N25	83 208.98 <b>Bi</b> Bismuth Purity N5	48 112.41 <b>Cd</b> Cadmium Purity N5	24 51.996 <b>Cr</b> Chromium Purity N6	27 58.933 <b>Co</b> Cobalt Purity 4N	29 63.546 <b>Cu</b> Copper Purity 5N	66 162.5 <b>Dy</b> Dysprosium Purity 3N5	64 157.25 <b>Gd</b> Gadolinium Purity 4N	32 72.640 <b>Ge</b> Germanium Purity N
79 196.97 <b>Au</b> Gold Purity 5N	72 178.49 <b>Hf</b> Hafnium Purity 4N ex Zr 3	67 164.93 <b>Ho</b> Holmium Purity N5	49 114.82 <b>In</b> Indium Purity 6N	77 192.22 <b>Ir</b> Iridium Purity 4N	26 55.845 <b>Fe</b> Iron Purity 4N	82 207.20 <b>Pb</b> Lead Purity 5N	3 6.9410 <b>Li</b> Lithium Purity 2N8	12 24.305 <b>Mg</b> Magnesium Purity 5N	42 95.950 <b>Mo</b> Molybdenum Purity 4N
28 58.693 <b>Ni</b> Nickel Purity 4N	41 92.906 <b>Nb</b> Niobium Purity 4N	46 106.42 <b>Pd</b> Palladium Purity 5N	78 195.08 <b>Pt</b> Platinum Purity 4N	75 186.21 <b>Re</b> Rhenium Purity 4N	45 102.91 <b>Rh</b> Rhodium Purity 4N	44 101.07 <b>Ru</b> Ruthenium Purity 4N	14 28.086 <b>Si</b> Silicon Purity 5N	47 107.87 <b>Ag</b> Silver Purity 5N	73 180.95 <b>Ta</b> Tantalum Purity 4N
52 127.60 <b>Te</b> Tellurium Purity 6N	50 118.71 <b>Sn</b> Tin Purity 6N	22 47.867 <b>Ti</b> Titanium Purity 4N	74 183.84 <b>W</b> Tungsten Purity 5N	23 50.942 <b>V</b> Vanadium Purity 4N	39 88.906 <b>Y</b> Yttrium Purity 3N5	30 65.380 <b>Zn</b> Zinc Purity 6N	40 91.224 <b>Zr</b> Zirconium Purity 4N ex Hf *		

\* crystal size limited to a few millimeters



# Available Geometries

Princeton Scientific offers various geometric shapes when it comes to Metal Single Crystals. Below you will find most common shapes, however custom designs are also feasible. Detailed drawings with template specifications required for quotation are listed on our website at <https://princetonscientific.com/crystal-config>



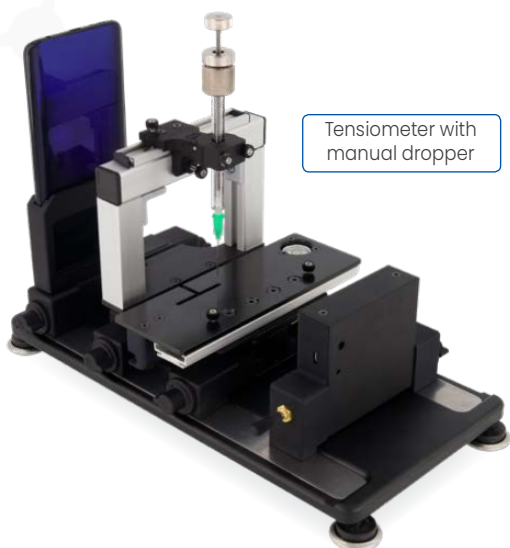
# ADDITIONAL SERVICES



- High Quality Crystal Processing of customer provided materials
- Re-polishing of customer provided materials (both or single side)
  - Roughness <10nm (typically 1nm for hard metals and typically <1-5nm for soft metals, even for Pb)
  - orientation accuracy <2 deg
  - orientation accuracy <1 deg
  - orientation accuracy <0.4°
  - orientation accuracy <0.1° (possible up to <0.05°)
- Cutting and/or orienting customer provided crystals
- Laue pictures
- Measuring of roughness
- Diverse cuttings and cut of geometrics according to your specifications
- Diverse drillings
- Etching of the surface according to your specifications
- Installation of a wire for direct electronic contact of the sample
- Installation of chamfers
- Bonding & de-bonding of sputtering targets
- Complete coating services

# TENSIOMETERS

Effortless setup, intuitive operation, and peer-reviewed accuracy. Providing accurate contact angle, surface tension, surface energy, and sliding angle measurements, Princeton Scientific Corporation offers researchers and educators the technical capabilities normally found in far more expensive and cumbersome scientific equipment.



Tensiometer with manual dropper



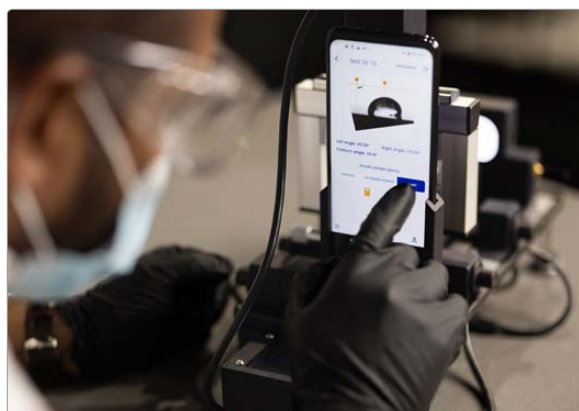
Tensiometer with automatic dropper

## MEASUREMENT

- Static and dynamic contact angle
- Static and dynamic surface tension
- Sliding angle
- Surface energy

## METHODS

- Young-Laplace and Polynomial
- Young-Laplace
- Polynomial
- Equation of States, Fowkes, Oss and Good



## FEATURES



### Cost-Effective

Our instrument drastically reduces the initial investment costs associated with tensiometers while maintaining high end features.



### Easy To Use

The app at the heart of the tensiometer is simple and intuitive to use, bypassing any need for paid user-training courses. With our Dropometer you can be up and running in less than twenty minutes.



### Smartphone-Based

The system doesn't require the use of additional laptops or desktop computers and benefits from the full connectivity of a smartphone.



### Portable

Tensiometer's significantly reduced size and weight makes it the ideal choice for teaching and fieldwork measurements.



### Peer-Reviewed

The patented technology that the tensiometer is built on was designed by experts in the field of tensiometry and has undergone extensive peer review, ensuring the system operates to the highest standards.

# Product Specifications



**Dimensions:** 30(H) x 15(W) x 45(L) cm

**Weight:** 1 kg

**Drop volume with manual dropper:** 1 rotation is 5.29  $\mu\text{L}$

**Min. drop volume with automatic dropper:** 0.05  $\mu\text{L}$

## MEASUREMENT

	Contact angle	Surface energy	Sliding angle	Surface tension
Range	10° to 175°	Up to 100 mN/m	10° to 175°	Up to 75 mN/m
Resolution	0.01°	0.01 mN/m	0.01°	0.01 mN/m
Accuracy	0.35°	0.03 mN/m	0.35°	0.03 mN/m
Model	Young-Laplace and polynomial	Equation of states, Fowkes Oss and Good	Polynomial	Young-Laplace
Drop type	Sessile advancing, receding and static	Static sessile	Tilting sessile	Pendant static and dynamic

## TILTING PLATE AND DOSING

Control	Manual and Automatic
Range	0° to 60°
Dosing system	Manual & Automatic
Minimum Drop Volume with Automatic Dosing	0.05 $\mu\text{L}$
Drop Volume with Manual Dropper	1 rotation is 5.29 $\mu\text{L}$

## SOFTWARE

Application	Android and iOS based software
Security	Multiple user account per device
Data sharing	Email and cloud (Google drive, Dropbox, MS One drive and Box)
Interfaces	Bluetooth, wifi, usb, cellular

## CAMERA

Performance	10 fps
Zoom	4x
Focus	Manual
Sensor	Trigger control based on camera level

## ENVIRONMENT

Temperature	10° to 45°
Humidity	Without condensation

## INSTRUMENT DIMENSION

Footprint	30(H) x 15(W) x 45(L) cm
Weight	1 kg

## POWER

Voltage	5 V battery operation
Battery time	Up to 8 h

# PRECISION WIRE SAWS

Precision wire saws available from Princeton Scientific have been developed with an improved cutting technique that utilizes the precision guidance of the width and uniform application of an abrasive slurry.

This results in:

- Surface is almost 'lapped' quality
- Cutting that does not introduce deformations
- Minimal loss of material
- Wire diameters from 20  $\mu\text{m}$  to 60  $\mu\text{m}$
- No "wandering" of cutting wire into an unintended direction
- Cut samples up to size 80 mm x 80 mm x 150 mm
- Semi-automatic, requires no supervision

These precision wire saws are ideal for the precise cutting of:

- Semiconductors
- Ferrites
- Metals
- Glasses
- Other Hard or Brittle Solids

A variety of precision wire saws are available that can cut samples down to a thickness of 10  $\mu\text{m}$ , with smooth cut surfaces where the roughness does not exceed 1  $\mu\text{m}$ . With a goniometer mounted to the saw, very precise orientations of crystal surfaces are possible before the cutting process begins.



## One saw, two cutting methods: dry and wet

The **WS-25 wire saw** is the first wire saw that can cut with free abrasive method as well as with diamond dotted wire. The WS-25 wire saw is fitted with an adjustable sample support with an electronic vertical axis. The sample is automatically moved up during the cutting process. The wire frame stays at the same vertical position throughout the entire process.

The **WS-25 wire saw** has been developed to meet two important requirements: 1) cutting should not introduce deformations or defects, and 2) loss of material should be minimized.

These two requirements have been met by the development of an improved cutting technique which utilizes the precision guidance of the wire and uniform application of an abrasive slurry. The WS-25 wire saw is a semi-automatic machine and requires no supervision during its operation. The wire saw can be used for precision cutting of semiconductors, ferrites, metals, and glasses, as well as many other hard or brittle solids. The WS-25 wire saw enables cutting of very thin slices (down to a thickness of 10  $\mu\text{m}$ ) with smooth cut surfaces (where surface roughness does not exceed 1  $\mu\text{m}$ ).

# PRECISION WIRE SAW WS 25B



## ADVANTAGES

- Semi-automatic, requires no supervision
- Can cut semiconductors, ferrites, metals, glasses and other hard or brittle solids
- Minimized material losses (>30  $\mu\text{m}$ )
- Slices samples perfectly parallel
- No additional lapping required
- Can be used with accessories to extend the saw's application in precision cutting

## TECHNICAL DATA

- **Sample max. dimensions:** 80 mm x 80 mm, 150 mm length
- **Power supply:** 220-250 V/50 Hz or 110 V/60 Hz
- **Tungsten wire diameter:** 20-60  $\mu\text{m}$
- **Diamond dotted wire:** 100-300  $\mu\text{m}$
- **Wire Oscillation Frequency:** 150-200/min
- **Weight:** 68 kg
- **Dimensions:** 630 x 720 x 250 mm



## Accessories

Extend the capabilities with accessories to aid in the precise cutting of crystallographically oriented crystals.



### PSC Stereomicroscope

Our stereomicroscopes are used for stereoscopic observation of samples with the use of changeable magnification. Stereomicroscopes are mounted on to wire saws frame.



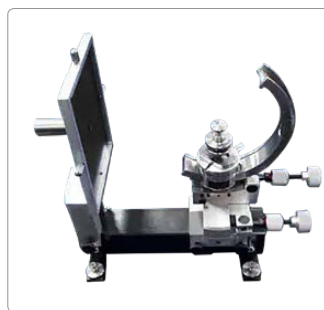
### Vacuum Sample Holder

Vacuum Sample Holder is designed to use a vacuum to hold a glass plate, on to which samples are fixed with wax.



### Goniometers

Our goniometers are designed for orientation of specimen when cutting along desired directions using either X-ray or optical orientation techniques.



### Laue Cameras

Laue cameras are designed for the orientation of single crystal samples using back reflection known as the Laue method. They are used for cutting along strictly determined crystallographic planes.

# DIAMOND WIRE SAWS

## Saws with wire spools

### Two-Way-Cut

Our two-way diamond wire saws work with a spool wire, which is wound onto the wire drum nearly fully automatically. During the separating cut, the diamond wire moves alternately forwards and backwards over the entire length of the wire. This enables a small machine design despite an occupancy of 20 or 30 meters of diamond wire.

- Use of spool wires
- Automatic wire spooling
- Small, compact saw design
- Long wire lengths (20 - 30 m)
- Thinnest cut-offs (from 0.08 mm)



**DWS.100**

The diamond wire saw type DWS.100 is a table saw in horizontal design so that the smallest cut-offs can be observed with the naked eye or also by means of an attached microscope. The maximum workpiece cutting area is 90 x 90 mm and the recommended diamond wire thickness is 0.08 to 0.35 mm. The wire speed is 0-4 m/s.



**DWS.175**

The diamond wire saw type DWS.175 is a table saw in vertical design. The maximum workpiece cutting area is 175 x 175 mm and the recommended diamond wire thickness is 0.15 to 0.50 mm.



**DWS.250 & 250E**

The diamond wire saw DWS.250E (endless) is a one-way table saw in vertical design. The maximum workpiece cutting area is 250 x 250 mm. Diamond wire loops with a length of 2000 mm and thicknesses from 0.35 to 0.60 mm are used.

The DWS.250 type diamond wire saw is a large two-way vertical table saw. The maximum workpiece cutting area is 250x250 mm and the recommended diamond wire thickness is 0.20 to 0.50 mm. The wire speed is 0-4 m/s.



**DWS.375 & 375E**

The diamond wire saw DWS.375E (endless) is currently our largest one-way saw in vertical design. The maximum workpiece cutting area is T375 x H375 mm. Diamond wire loops with a length of 3000 mm and thicknesses from 0.35 to 0.80 mm are used.

The diamond wire saw DWS.375 is our largest two-way saw in vertical design. The maximum workpiece cutting area is T375xH375 mm. Suitable for diamond wires with a diameter of 0.25 to 0.5 mm at a length of 50m. Wire speed is 0-10 m/s.

## Examples of separation



10-cent piece



Meteorite



IC-chip



Objective

## Saws with wire loops

### One-Way-Cut

Our one-way diamond wire saws work with endless wire loops. Since these only cut in one direction and the motor is not alternately braked and accelerated again, it is possible to cut at correspondingly higher speeds. Depending on the type of saw, a wire loop 2 to 3 meters in length is used.

- Use of diamond wire loops
- Easy and fast application of these loops
- Higher cutting speeds - up to 12 m/s
- Clean cut surfaces - cut in one direction
- Thin cuts - from 0.35 to 0.80 mm

# UHV TECHNOLOGY



**Princeton Scientific Corp. offers high quality vacuum products, systems, and custom-built vacuum equipment.**

Princeton Scientific Corp. delivers high-performance ultra-high vacuum (UHV) and high vacuum (HV) technology for demanding applications. Our capabilities extend from chamber design and fabrication to a full range of accessories and components required to build, maintain, and utilize reliable, fully-functional vacuum systems. UHV technology is a vast and ever-growing field of research that contributes to a wide array of industries. It is UHV technology that is leading the world to greater innovation and discovery. When your work is this important, it is crucial to know that you are receiving equipment of the highest quality and standards. Princeton Scientific's mission is to supply this high-quality technology to companies and institutions like yours, so you can continue to do the work that is changing the world.



## MANIPULATORS

- Single bellows
- Dual bellows
- Sample holders
- Motor controllers
- XY modules
- Sample heating
- Sample cooling



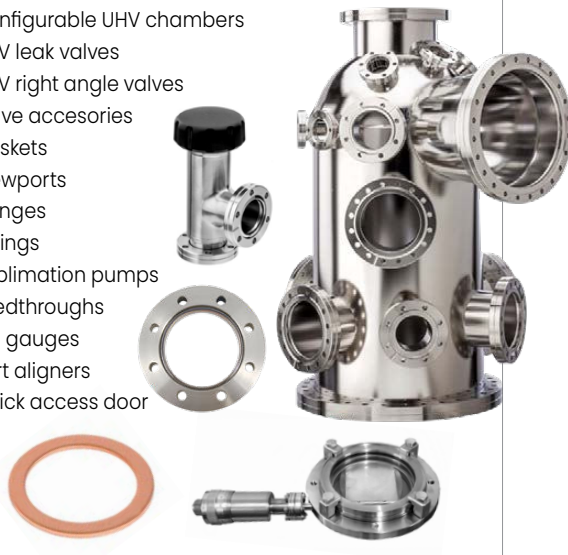
## DRIVES & MOTIONS

- UHV linear drives
- Rotary drives
- Wobble sticks
- Magnetic transfer probes
- Non-magnetic transfer probes
- Rotary platforms
- Z axis linear transfer
- Motorization and encoding



## CHAMBERS, VALVES & ACCESSORIES

- Configurable UHV chambers
- UHV leak valves
- UHV right angle valves
- Valve accessories
- Gaskets
- Viewports
- Flanges
- Fittings
- Sublimation pumps
- Feedthroughs
- Ion gauges
- Port aligners
- Quick access door



## COMPONENTS

- CF, KF and ISO flanges and fittings
- Circular miniature feedthroughs
- Co-axial feedthroughs
- Power/high voltage feedthroughs
- Sub-miniature D feedthroughs
- Thermocouple feedthroughs
- Traxial feedthroughs
- Fibre optics
- Kapton wires and accessories
- Safety components
- Gauges
- Viewport accessories

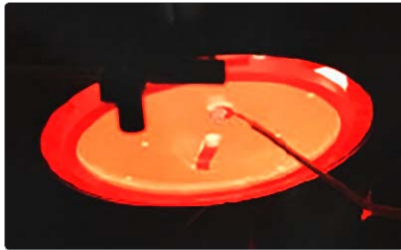


# VACUUM SYSTEMS

We offer comprehensive turnkey solutions for vacuum systems, along with custom engineering services.

## THERMAL EVAPORATOR SYSTEMS

This box type Physical Vapor Deposition system is based on prismatic/cylindrical vacuum chambers. These systems have 2 – 4 thermal sources. Multi-layered thin films of two, three or four different materials can be prepared, and the system can be tailored to fit user needs to produce multilayered, nanosized metallic oxide, fluoride or nitride films, such as Si, Al, Ti, SiO, Au, Ag, WO, BaF2, and MgF2.



## THERMAL & SPUTTER COMBINED SYSTEMS

This box-type Physical Vapor Deposition system, based on prismatic/cylindrical vacuum chambers, has 2 thermal and/or 1-4 DC-RF sputter sources enabling the user to do full co-evaporation. Multi-layered thin films of different materials can be prepared, and the system can be tailored to fit user needs to produce multilayered nanosized metallic oxide, carbide or nitride films, such as Si, Al, Ti, SiO, WO, BaF2, MgF2, TiO2, Si3N4, SiO2, and TiN.



## BELL-JAR TYPE THERMAL SYSTEMS



Bell Jar type simple evaporator for day-to-day use. Up to four box style evaporators can be integrated. If needed, these can be dedicated for Zn, In, Cd, Ca, Pb evaporation, sequentially or to deposit any materials. Systems can be tailored to produce multilayered nanosized metallic oxide, fluoride and organic films. Standard features such as the thickness monitor and QCM sample rotation units can be comfortably utilized by the user. Typical cycle time for two-layer thin film coating experiment is about 1.5 hours. Base Pressure is  $5 \times 10^{-7}$  Torr.

## VACUUM FURNACE & BAKE-OUT SYSTEMS



The Vacuum Furnace and Bake-Out System is produced out of SS304. The furnace can be used for outgassing & baking samples between 30 - 500 °C. Samples can be loaded vertically or horizontally. Various electrical feed-throughs can be added for real time monitoring of electronics. The PSC Vacuum Furnace and Bake-Out System can be tailored to fit user needs.



## GLOVE-BOX ADAPTED VACUUM SYSTEMS

PSC Glove-Box Systems combine Glove-Box units supplied by dedicated Glove-Box specialists and PSC vacuum and electronic components. These systems can be configured with one or two vacuum chambers with hinged doors in the back and sliding doors on the Glove-Box side. There are added components such as vacuum pumps and QCM units. Systems easily pump down to  $1 \times 10^{-7}$  Torr vacuum levels. Components such as thickness monitors, sputter guns, evaporation sources and effusion cells can be added. The chambers are e-polished on the inside and outside. Systems are configured to run automatically with tailored LabVIEW programs. The Glove-Box sustains 0.1 ppm water vapor and oxygen levels with its blower and filter apparatus.



## MAGNETRON SPUTTERING SYSTEMS

Box-type Physical Vapor Deposition systems are based on prismatic/cylindrical vacuum chambers. These systems have 1-4 DC/RF sputtering sources. Multi-layered thin films of 4 different materials can be prepared. The PSC Sputter System can be tailored to fit user needs to produce multilayered nanosized metallic oxide, carbide or nitride films, such as Ni, Fe, Au, Zr, Ti, Si, SiO<sub>2</sub>, ZnO, TiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub> and SiC, among others.



## HIGH-POWER SPUTTERING SYSTEMS



HIPIMS systems are based on high energy pulsed DC magnetron technology. In this method, 500-1000 VDC short duration pulses are sent to targets with 100-500 A/cm<sup>2</sup> currents to generate very high ionization plasma density. Consequently, very dense, well-adhered, high-quality films can be obtained. Oxide and nitride films can also be made by HIPIMS reactive sputtering using metallic targets. The substrate holder can be biased to DC pulsed voltage with high accuracy synchronization to the target pulse. These systems can have up to 4 sputtering sources. Therefore, up to 4 multi-layered materials can be produced including nanosized metallic, oxide, fluoride or nitride films.

## PECVD SYSTEMS



PSC has recently developed a PECVD (Plasma Enhanced Chemical Vapor Deposition) tube furnace system, which consists of a 300 W RF plasma source, optional split tube furnace, and 3 channel mass flow controller units for gases like Ar, H<sub>2</sub>, CH<sub>4</sub>. It is ideal for Graphene film production as well as TiN, TiC, SiC, Si<sub>3</sub>N<sub>4</sub> films.

## E-BEAM SYSTEMS

Water-cooled cylindrical/prismatic vacuum chambers are produced out of SS304 material. This system has 1-2 thermal and/or 6-crucible e-beam sources enabling the user to do full co-evaporation. Typical properties of the system can be given upon request. Multilayered thin films of different materials can be prepared. The system can be tailored to fit user needs to produce multilayered nanosized metallic oxide, carbide or nitride films.



## SPACE SIMULATOR SYSTEMS



PSC has developed a space simulator system that enables the user to conduct vacuum, gas, and temperature-dependent experiments using a computer user interface. The chamber volume can be 200 - 1000 lt. and can house a thermal table which may be heated and cooled and may carry loads up to 100 kg. Base pressure level is  $10^{-7}$  Torr and pressure can also be controlled by a leaking mixture of Ar, N<sub>2</sub> and O<sub>2</sub>, H<sub>2</sub> gases from  $10^{-7}$  to 1000 mbar. The table can be cycled between  $-100^{\circ}\text{C}$  and  $+150^{\circ}\text{C}$  for long periods.

## LOAD-LOCK EQUIPPED COATING SYSTEMS



Systems with Load-Lock chambers are preferable for faster processing and higher quality coating of products. Sample loading/unloading is done in the Load-Lock chamber. Transfer to the main chamber is performed using a magnetic transfer arm. Within our product range, Load-Lock enhancement is applicable to Thermal, Sputtering, E-Beam or HiPIMS type systems. It may be possible to complete the coating process in  $10^{-7}$  Torr high vacuum cleanliness while loading a new wafer every 15 minutes with the Load-Lock setup.



# PARTICLE BEAM LINE

Princeton Scientific Corp. supplies products and services to the accelerator scientific community.

Our areas of expertise include beamline systems, and beam diagnostic devices for research, industrial, and commercial accelerator systems. We specialize in designing accelerator-related equipment. Our main industry contacts - such as scientists & engineers all over the world - support commitment to innovation, quality, and customer satisfaction. We provide end to end design and engineering and integration solutions to scientists worldwide. Our Faraday Cups, Beam Stoppers, Beam Profile Measurement Systems and UHV Linear and Rotating Feedthroughs are well known within the scientific community.

## VACUUM TECHNOLOGY

We design and manufacture vacuum chambers of different shapes for various applications. As a speciality, we offer Al-chambers with inhouse developed Bi-metal-flanges. Cylindrical or rectangle UHV chambers are used for installation of beam diagnostic devices, vacuum gauges, electrical feedthroughs, and pumping aggregates. The distance between supporting flanges and beam axis should be uniform after optimization of various components, that must be attached. Universal elements such as compressed air actuated feedthroughs for example, can be designed with identical stroke and are subsequently exchangeable along the accelerator line.



## METAL-CERAMICS BONDS

Ceramic chambers are widely used in accelerator units for injection, fast extraction and beam excitation. These alumina chambers are placed in fast pulsed (range of nanoseconds) electromagnets of the kicker, bumper, dumper or scanner application. The reason for applying ceramic chambers is to avoid shielding of a fast changing external magnetic field by metallic chamber walls and to avoid heating, due to eddy currents. To prevent accumulation of static charges and to reduce secondary electron emission on the ceramic surface the internal surface has to be coated by a thin low conductive layer.



## RFQ ACCELERATOR STRUCTURES



Various RFQ structures of the 4-rod type from pulsed to cw-operation.

- Design and manufacturing of RF-systems
- Design and manufacturing of vacuum systems

## DRIFT TUBE PARTICLE ACCELERATORS



We have extensive experience in the field of particle accelerator design and manufacturing.

- IH-structures
- CH-structures
- Special Resonators, e.g. Buncher Cavities

## JAW SLIT SYSTEMS

Jaw slit systems available are used for beam size limitation, beam analysis functions, and energy definition in beam transport systems of particle accelerators. The slit-jaw system can consists of a cooled copper block which is covered with a tantalum plate. To facilitate good heat

conductivity between copper and tantalum, a special vacuum braze has been chosen (SCP 3 AT, 930°C Degussa). To avoid tension between Ta jaw and Cu body components, a thin copper plate has been placed between the jaw and the body of system.



## HIGH VACUUM FEEDTHROUGHS

Universal precision high vacuum feedthrough with an accuracy of positioning of +0.03 mm (single or twin version). The subject feedthrough is provided for the linear translation of elements inside a high-vacuum system. The universal feedthrough allows for mounting of arbitrary elements at the bottom of the spindle (inside the vacuum). Cooling of the attached elements is possible through the bore of the spindle. In the field of accelerator technology, our universal feedthrough is useful for assembly of slit systems, emittance measurement devices, scanners and frequency tuners.

- Universal Precision High Vacuum Feedthrough
- Compressed Air Actuated High Vacuum Feedthrough
- Simplified Precision High Vacuum Feedthrough - Twin Version



## BEAM PROFILE MEASURING SYSTEM

For measurement of intensity distribution of an accelerated ion or electron beam in two transverse directions (X and Y). Optional grids are available that permit measurement of additional planes. Principle: wires to be used for X and Y planes collect charged particles; the collected charge is then converted to a given energy level, which represents beam profile intensity.

Configuration of Complete System:

- Compressed air actuated high vacuum feedthrough (permits harp to move 'in' and 'out' of the beam path)
- Harp and frame with adapter (permits unit to be connected to compressed air actuated feedthrough)
- Signal processing electronics



## FARADAY CUPS

For measurement of mean beam current of particle accelerator we offer cooled, uncooled or coaxial Faraday Cups. Accelerated particles (high energy primarily) are stopped in the cup and an electric charge is detected as corresponding electric current. The Faraday Cup may be moved into the beam by means of an air pressure actuated vacuum feedthrough.



## EMITTANCE MEASUREMENT DEVICE

The device consists of precision high-vacuum feedthrough, detectors assembly with emittance measurement chamber, and slit/ detector assembly. Via a narrow slit, part of the beam is selected for measurement. Behind the slit, a detector system is positioned, permitting measurement of beam divergence for the selected bundle. This is accomplished by means of current measurement on the multistrip collector array.



## CAPACITIVE PICK-UP PROBES

Various capacitive pickup probes custom made for your requirements

- Phase probes & Beam position monitors
- Design incl. signal calculation
- Engineering and manufacturing



## LUMINESCENT SCREENS

Beam profile measurement with luminescent screens of your choice on customized linear or flip feedthroughs.



## BEAM STOPPER

The beam stopper is provided to collect accelerated particles and can be mounted on the end of a beam line or on the down-stream flange of a standard diagnostics chamber.



## VARIABLE SEGMENTED APERTURE

The variable segmented aperture fits into the entrance ports of vacuum chambers for:

- Beam size limitation
- Rough estimation of beam position



# PLASMA TECHNOLOGY

## Extensive range of Vacuum Plasma Systems and Supporting Equipment.

RF (Radio Frequency) plasma generators create controlled plasma for applications like semiconductor manufacturing and material processing.

They offer precise ionization control, enabling uniform surface modifications crucial for processes such as thin-film deposition and plasma etching.



### RF PLASMA GENERATORS

These are reliable devices for industrial and laboratory deposition, plasma generation, and even dielectric heating and melting. This device is also one of the most important components of semiconductor manufacturing systems, used for producing integrated circuits (ICs) and chips present in modern computers and electronic equipment.

### DC POWER SUPPLIES

DC power supplies for Sputtering and Plasma generators manufactured by Princeton Scientific are reliable devices for industrial and laboratory deposition, plasma generation, and even dielectric heating and melting. High-voltage power supplies are offered in the 800-120000 V range. An important feature of the high voltage power supplies is the low storage energy in the output stage and their small size.



### RF PLASMA MATCHING NETWORK

The Automatic Matching Network for RF plasma control changes the RF Generated impedance of the plasma chamber to 50 ohms to reach the maximum power from the generator to the chamber. Princeton Scientific automatic matching networks perform their operation in three independent modes. The automatic mode continuously compensates the impedance variation of the plasma enclosure. The manual mode allows the operator to change the matching capacitance values during the process. In the preset mode, the operator can automatically adjust the capacitance values close to the complete matching condition at the outset so that the matching is performed faster.

### MAGNETRON SPUTTERING SOURCES

GT02 and GT20 2" magnetron sputtering sources are designed for precision thin-film deposition in advanced material research and industrial applications.

- **Compact Design:** Ensures efficient utilization of chamber space while providing optimal target utilization.
- **Superior Performance:** Engineered for uniform deposition, high target utilization rates, and minimized contamination.
- **Versatile Compatibility:** Compatible with a wide range of materials, including metals, alloys, and ceramics.
- **Robust Construction:** Built for durability and consistent performance in high-vacuum environments.



# DESKTOP COATERS



DESKTOP COATERS



Elevate your research and production processes with our state-of-the-art Desktop Coater, an essential component of our precision vacuum coating system.

Designed for versatility and performance, our desktop coater offers an array of features to meet your coating needs.

## SPUTTER COATERS

The Princeton Scientific Desktop Sputter Coater enables thin film sputter coating of noble metals: gold (Au), palladium (Pd), platinum (Pt) and gold/palladium (Au/Pd) on non-conductive or poorly conductive samples or devices.



## CARBON COATERS

Our desktop Carbon Coating System compact carbon fibre coating system suitable for sample preparation for the use in Scanning Electron Microscope (SEM), Transmission, Electron Microscope (TEM) and X-Ray analysis (EDX).



## TURBO-PUMPED COATERS

We offer a compact and easy-to-use sputter coater, with onboard Turbomolecular Pumping. Use a supplied backing vacuum pump or your own, all controlled with the processor controller.



## THERMAL EVAPORATION COATERS

Our Desktop Thermal Evaporator system is used to deposit thin layers of materials on substrates for research purposes and investigation by electron microscopy. DTE is configured as a material evaporator. This low-budget, small chamber, and high-vacuum system is ideal for short time deposition of noble and oxidizing metals



## PLD & THERMAL EVAPORATOR SYSTEMS

The versatile Pulsed Laser Deposition and Thermal Evaporator System is a high vacuum thin film deposition system which enables the deposition of different materials by both Pulsed Laser Deposition and Thermal Evaporation technique. It can deposit complex materials and crystalline structures onto substrates with very little setup involved.



## VACUUM COATERS FOR GLOVEBOX

The Thermal Evaporation or/and Sputter system is for a vast range of source materials in various forms from wire, cord, pellets and powders, compatible with Boat/basket and coil source holders. Glovebox compatible, it comes with remote control, and a motorized chamber lift mechanism.



# PRINCETON SCIENTIFIC CORPORATION®



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Woman Owned Small Business

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