robeko

www.robeko.de

TECHNOLOGY, COMPONENTS & MATERIALS FOR PVD & PECVD

SPUTTER SOURCES

PLASMA GENERATORS

PROCESS TECHNOLOGY

REACTIVE GAS CONTROLLERS

3D CAD DESIGN

CUSTOM COMPONENTS

SPUTTERING TARGETS

RETROFITS

CATHODE ENVIRONMENTS

SERVICES

MATERIALS

EVAPORATION MATERIALS

BACKING TUBES

BACKING PLATES

TARGET BONDING

About Us

robeko – Excellence in Sputtering and Bonding

Founded in Rhineland-Palatinate in 2002, robeko is a leading manufacturer of sputtering targets and bond services as well as a supplier of highest quality process hardware for thin film deposition, especially for sputtering.

robeko provides state-of-the-art solutions for specific coating problems of ambitious customers. We focus on individual technical requirements and at the same time believe in the value of human relationships. The balance between these two elements enables us to develop cost-effective solutions tailored to the demands of each of our customers.

Achievements and Prospects

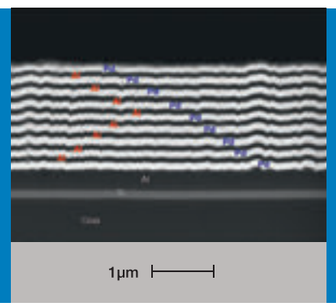
We supply state-of-the-art equipment, materials and solutions required for thin film deposition. In doing so, we aim high with respect to partnership, innovativeness and growth. This is our mission:

- Heading for the future, we closely cooperate with leading and highly skilled partners.
- In each and every case, we focus on the best technical solution for the benefit of our customer.
- We continuously explore new market areas and develop innovative technologies and products.
- We consider fair pricing to be the basis of long-term customer relationships and of sustaining growth.

Powered by Experience

- More than 20 years of experience in manufacturing and bonding of sputtering targets
- More than 25 years of experience in operating thin film coating machines and coating development
- More than 25 years of experience in distributing process hardware and application engineering

Product Overview

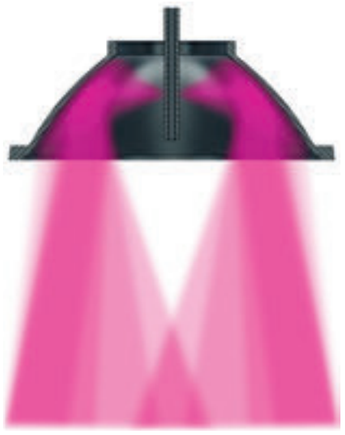


All technical specification in this catalogue are subject to change without prior notice, to make sure your requirements are met request please.

Microwave Plasma Source MIRO-200-CI

- Filament free and gridless Plasma Source
- Uniform directional beam profile
- Optional magnetic plasma localization module
- Very low ion energy (for epitaxic film growth)
- Compatible with adjacent processes e.g. sputtering

FEATURES

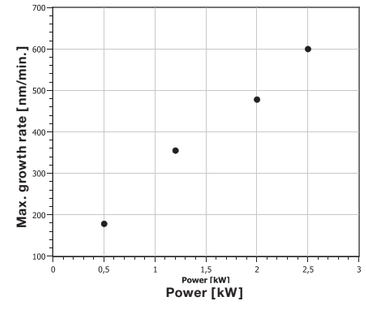


- Microwave power coupling
- Standard mounting flange geometries
- Use multiple sources as array to cover larger substrates
- Complete scope of delivery including generator and power cable
- Applicable in batch and in line systems
- Localization mode option allows adjustable plasma position and concentration of the full power in a small volume close to the substrate
- Automatic Impedance matching via Profibus control

PECVD & Plasma Treatment

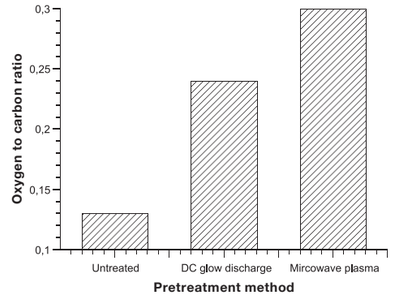
Applications

- High rate Ar ion etching
- Addition of nitrogen, carbon or oxygen ions and radicals into a plasma process
- Plasma nitriding or oxidation
- High rate deposition of a-C:H and ta –C:H
- PVD/PECVD hybrid processes
- High rate deposition of carbon based low friction nanocomposites
- PECVD processes for low stress optical coatings, e.g. SiO_2
- Plasma treatment of substrates



Process Data

- Very low adjustable plasma potential: between 2 eV and 10 eV
- Ion current densities of over/more than 1 mA/cm^2
- Deposition rate a-CH: 36 µm/h
- Operational pressure: 1,5 – 12 x 10^{-3} mbar
- Fully compatible with reactive gases and precursors Ar, O_2, N_2, C_2H_2, HMDSO etc.
- Power range from 0,3 – 2 kW
- High PECVD deposition rates. Example: HMDSO - 30 µm/h SiO_2
- Very good pretreatment capability
- Adjustable plasma density in localized plasma near the substrate



1 µm SiO_2 on PC

PECVD & Plasma Treatment

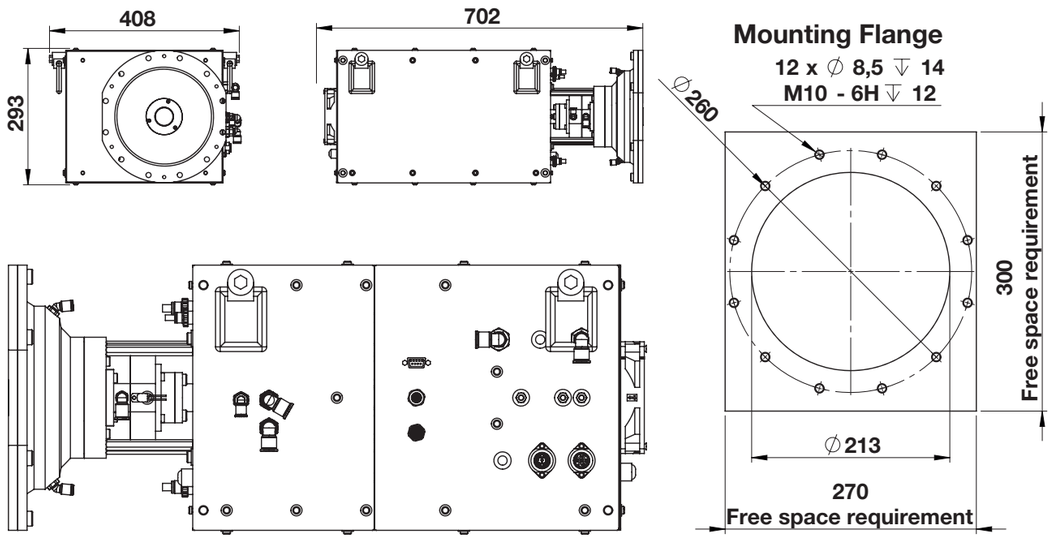
Scope of delivery

- Microwave source
- Microwave generator
- Connecting cable generator to source
- Automatik Tuner with Profibus Interface

Technical Data / Dimensions	
Source materials:	Stainless steel / Quartz / Aluminum / BN
Frame material:	Aluminum
Housing material:	Painted steel
Mounting flange:	Compatible with DN ISO-200 ISO-F.
Cooling water:	3 bar inlet, open outlet. Fitting: 8 mm push-to-pull 2 l/min Fitting: 10 mm push-to-pull 3,8 l/min
Compressed air:	4 – 8 bar
Weight:	50 kg for single source
Auxiliary Power:	24V, 2A

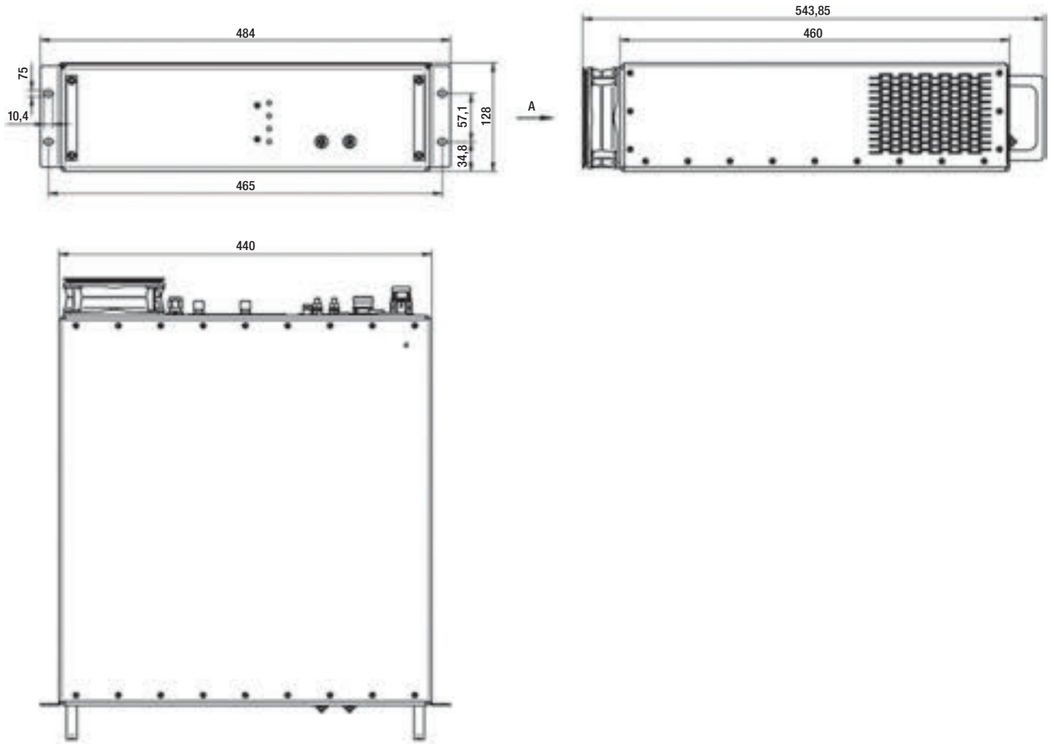
Accessories:

*Manual Tuner
Remote Control



PECVD & Plasma Treatment

Technical Data / Power Supply	
Input Voltage:	3x 400V~, 3 phase, <7,5A/phase
Input (auxiliary) Voltage:	1x 230V~, <2A
Environment:	INDOOR USE only
Operation Temperature:	5° C to 45° C
Water Fitting:	10 mm push-to-pull, 4 l/min
Dimension:	19'' rack (plug-in-case) 3U
Weight:	(approximately) 18 kg



PECVD & Plasma Treatment

SPUTTERING COMPONENTS®

BENEFITS

- Fits into your existing equipment
- Fewer process disruptions; longer campaigns
- Low cost of ownership
- Promotes film adhesion
- Reduced chance of substrate damage due to lower ion energies
- Drives off water vapor and other volatile contaminants from the substrate
- Wide operating pressure
- Highly tunable

envis-Ion™ DMPTS

The envis-ION™ Dual Magnetron Pretreatment Source has a wide range of operation for improved adhesion and durability.

FEATURES

- Flexible mounting options
- 200+ hours per campaign
- Hidden electrodes produce minimal contamination
- Compact design
- Long electrode life
- Wide operating pressure (1-40 mTorr)
- Compatible with other PVD processes
- Effective source to substrate range of 50-200mm
- Fast target change

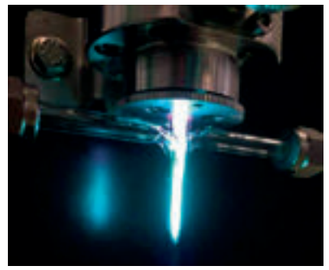
TECHNICAL DATA	
Model	DMPTS
Max Power	5 kW/m
Typical Power	2-4 kW/m
Operating Pressure	1-40 m Torr
Pet Surface Energy at 6.7 m/min	>65 Dynes

PECVD & Plasma Treatment

Industrial Microwave by Sairem

sairem microwave & radio frequency

SAIREM is among the international leaders specialized in microwave and Radio Frequency, for plasma generation, food processing, science and medicine. The key differentiator of SAIREMs knowledge is the ability to develop applications that cover the entire spectrum of electromagnetic energy and to scale up standard or custom made processes from laboratory up to industrial at power levels starting from a few watts up to several hundred of kW.



Microwave Plasma Solutions

SAIREM has developed a wide range of reactors and equipment for plasma generation, offering energy stability, short response time and high spectral quality for applications in plasma research, diamond deposition, surface cleaning, nanomaterials, abatement etc.

Microwave Components

SAIREM manufactures a wide range of standard components for transmission, measurement and adjustment of the microwave power.

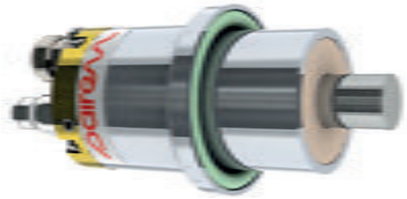
Microwave and RF Generators

SAIREM offers a wide range of microwave and radio-frequency generators, components, and accessories, with power level from a few watts up to one hundred kilowatt that cover all electromagnetic bands for Industrial, Scientific and Medical (ISM) applications assigned by the International Telecommunication Union (ITU).

Other Industrial Applications

SAIREM offers standard and tailor-made equipment and microwave technology for different high frequency assisted applications.

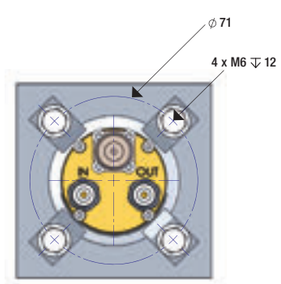
PECVD & Plasma Treatment

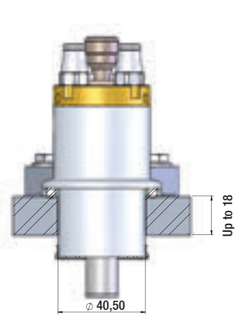


Aura-Wave – Coaxial ECR plasma source

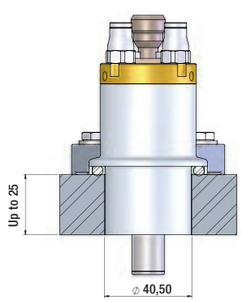
AURA-WAVE and HI-Wave are designed to be used equally in R&D laboratories and industry for a very large range of applications and it is ideal for working in the low pressure range i.e. with high energy particles.

Technical Data	
Frequency:	2,45 GHz
Microwave power:	Max. 450W
Working pressure:	10^{-3} – 10^{-2} mbar
Microwave connection:	Coaxial – Type N (Female)
Cooling:	Push-fit connectors for OD 6 mm tubing. Water-cooling ≥ 0,5 l/min
Recommended power supply:	GMS200, KMS200, GMS450, KMS450



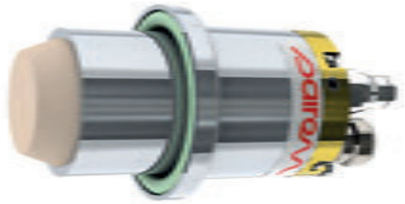


Mounting with Coating Shield



Mounting without Coating Shield

PECVD & Plasma Treatment



Hi-Wave – Collisional plasma source

AURA-WAVE and Hi-Wave are designed to be used with the frequency adjustable Sairem Solid State Microwave Generators and are prematched. No additional tuner is needed when working with the Sairem frequency tuning algorithm.

Technical Data	
Frequency:	2,45 GHz
Microwave power:	Max. 450W
Working pressure:	10^{-2} – 10^{-1} mbar
Microwave connection:	Coaxial – Type N (Female)
Cooling:	Push-fit connectors for OD 6 mm tubing. Water-cooling ≥ 0,5 l/min
Recommended power supply:	GMS200, KMS200, GMS450, KMS450

AURA-WAVE and Hi-Wave are designed to be interchangeable and have identical footprint and mounting options. Both sources can be used as single sources or as interference free arrays with a minimum spacing of 80 mm.

Solid state generator

Coaxial cable

Hi-WAVE plasma source

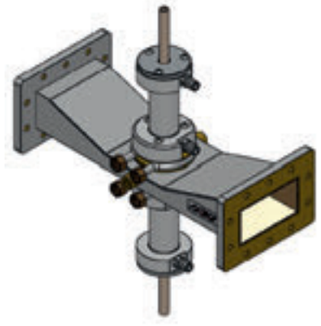
Surface wave plasma sources

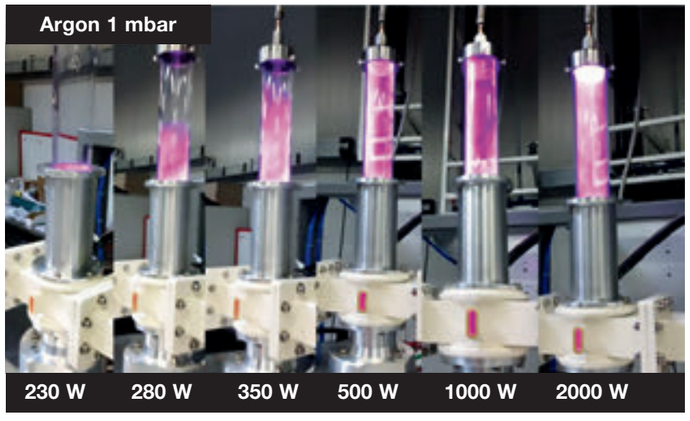
Surface wave type s of plasma source generate plasma in a dielectric material tube placed in the high power region of a resonant cavity perpendicular to the power ports.

The microwave electric field propagates longitudinally at the dielectric-plasma interface (plasma behaves as an electrical conductor)

Radially the wave is strongly attenuated at skin depth. This principle allows to create and maintain plasma columns with lengths which depend on the operating pressure, microwave power and gas nature.

Gas flow inside the dielectric tube allows to control the direction in which the plasma column will form.





Surface wave plasma sources – Technical Data

Type	Power	Dielectric Tube Diameters	Microwave Connector	Cooling	Working Pressure	Recommended Power Supply
Downstream WR340	Max. 6kW	30 | 40 | 50 mm	Waveguide WR340	Water + Air	10^{-2} mbar – ATM	GMP60K, GMP30K
Surfaguide WR 340	Max. 6kW	10 | 15 | 20 mm	Waveguide WR340	Water + Air	10^{-2} mbar – ATM	GMP60K, GMP30K
S-Wave	400 W	6 | 8 mm	Coaxial N-Type	Water + Air	10^{-2} mbar – ATM	GMS200, GMS450

PECVD & Plasma Treatment

Microwave Standard Components

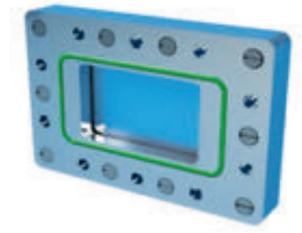
Waveguides

- Straight
- H-Bend
- E-Bend
- Twist

Impedance tuners, manual and automated

- 4-stub automatic tuner 915 MHz
- Manual 3-stub tuner 915 MHz
- 4-stub automatic tuner 2450 MHz
- Manual 3-stub tuner 2450 MHz
- E-H Impedance tuner
- Adjustable iris WR340

Sliding short circuit, manual and motorised



- Motorized sliding short circuit 2450 MHz
- Manual sliding short circuit 2450 MHz
- Motorized sliding short circuit 915 MHz
- Manual sliding short circuit 915 MHz

Waveguide to coaxial transitions

- Transition WR340 2450 MHz to coaxial adaptor (type N)
- Transition WR340 2450 MHz to coaxial adaptor (7/16)
- Transition WR975 915 MHz to coaxial 7/16

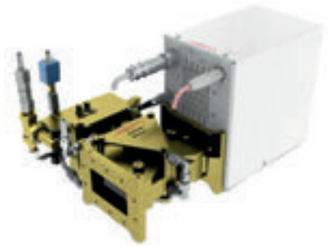
Windows quartz, alumina and PTFE

- Vacuum or high pressure microwave window (quartz)
- Microwave window (teflon)

Microwave Detector

- 915 MHz handheld microwave leakage meter IFP
- 2450 MHz handheld microwave leakage meter IFP
- 915 MHz Wall-mount microwave surveymeter DFM
- 2450 MHz Wall-mount microwave surveymeter DFM

PECVD & Plasma Treatment



Magnetron CW & Pulsed Microwave Generators

For years Magnetron based microwave generation has been the industry standard from heating applications to plasma generation. While having a bigger footprint than modern solid state technology they offer higher powers at low cost.

A Magnetron Microwave Generator generally consists of two parts. A High Voltage Switch-Mode Power Supply and an magnetron with launcher – typically a waveguide with opening for the magnetron.

All SAIREM Magnetron Microwave Generators offer continuous wave and pulsed power output.

Type	Power	Frequency	Output	Interface
GMP 20K	2 kW	2,45 GHz	Waveguide WR340	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus (RS485 & RS232)
GMP 30k	3 kW	2,45 GHz	Waveguide WR340	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus (RS485 & RS232)
GMP 60k	6 kW	2,45 GHz	Waveguide WR340	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus (RS485 & RS232)
GLP180K	18 kW	915 MHz	Waveguide WR975	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus (RS485 & RS232)
GLP350K	35 kW	915 MHz	Waveguide WR975	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus RS485
GLP540K	54 kW	915 MHz	Waveguide WR975	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus RS485
GLP720K	72 kW	915 MHz	Waveguide WR975	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus RS485
GLP1000K	100 kW	915 MHz	Waveguide WR975	Local: Front Panel Remote: Analog, Profibus, CanOpen, Modbus RS485

PECVD & Plasma Treatment

Solid State Microwave Generators

Solid state based microwave generators offer many advantages above Magnetron generators:

- Compact size and weight
- Stable operation at low power output
- Very good frequency spectrum even at low power
- Longer lifetime
- No Voltage above 230V AC
- True RMS detector for reflected power
- Very low ripple (<0,2% RMS)
- Adjustable Emission Frequency (2,45 GHz ± 50 MHz | 915 MHz ± 13 MHz)
- Sairem Auto-tune Algorithm which allows to control the frequency automatically in order to minimize the reflected power

All SAIREM plasma sources with coaxial input are optimized to take full advantage of the frequency tuning feature and will not need external tuning when paired with a SAIREM solid state power supply.

Type	Power	Frequency	Output	Interface
GMS 200	200 W	2,45 GHz	Coaxial Type N (female)	Local: Front Panel Remote Options: Profibus,CANOpen, Analog, Modbus (RS485 & RS 232)
KMS 200	200 W	2,45 GHz	Coaxial Type N (female)	Remote Options: Modbus RS232, CANOpen
GMS 450	450 W	2,45 GHz	Coaxial Type 7/16 (female)	Local: Front Panel Remote Options: Profibus, CANOpen, Analog, Modbus (RS485 & RS 232)
KMS 450	450 W	2,45 GHz	Coaxial Type N (female)	Remote Options: Modbus RS232, CANOpen
GMSP10	900 W	2,45 GHz	Waveguide WR340	Remote Options: Modbus RS232, Analog
GLS 600 W	600 W	915 MHz	Coaxial Type 7/16 (female)	Local: Front Panel Remote Options: Profibus, CANOpen, Analog, Modbus (RS485 & RS 232)

ionics surface technologies

A micro-accelerator of particles generates a highly energetic ion beam able to penetrate the surface of materials and to enhance their properties without any coating.

The penetration depth might reach up to 10 microns and the treatment effects are still measurable until 1 mm. Depending on the nature of the implanted ions and the process parameters, you may obtain chemical modification, doping effect, surface amorphisation, re-alloying or nano-structuring.

The part temperature never exceeds 80°C: a cold metallurgy. The technology might be combined with other low-pressure technologies like PVD and PECVD processes to obtain even more breakthrough properties and performances.

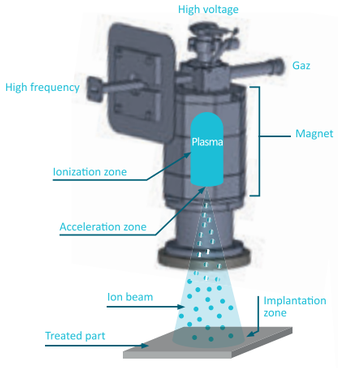
SMART Surfaces by IONICS

IONICS develops and supplies specialty surface technologies for metal, glass and other substrates. Our demanding and ambitious customers capitalize on our innovative technologies and responsive service. Our product portfolio finds use in various industries: automotive, architecture, household appliances, telecommunication, electronics, life science,…

Our vision is to be a leading company in functionalized surface treatments, enabling our customers to explore new product applications by using our smart surface solutions and technologies.

ionGUN ion implantation technology

ionGUN 2000



Technical Data	
High frequency power supply:	10 GHz / 50 W
High voltage power supply:	Power: up to 600 W Extraction voltage: up to 40 kV Ion current: up to 15 mA
Gas flow:	From 10 to 200 ln / min
Vaccum chamber level:	Below $3e^{-6}$ mBar
Connection:	160 ∅ flange
Water cooling system:	yes

Ion Implantation

ionLAB

The ionLAB system allows the treatment of middle size substrates with the innovative ionGUN ion implantation technology.

ionLAB 400

Technical Data / Dimensions	
Dimensions:	l 350 cm x w 150 cm x h 230 cm
Weigth:	2800 kg
Max. substrate size:	XY table to allow treatments on 400 x 400 mm samples up to 200 mm/s
Number of ion guns used:	1 or 2
Number and type of optional other coating sources:	3 rotaty cathodes and 1 ion source for vertical treatment in the coming months
Type of water cooling system:	Demineralized Water integrated on the machine
Basic vacuum pressure:	10^{-7} mbar in MAP / 10^{-6} in Chamber

PROCESS ADVANTAGES

Common for all systems using the ionGUN ion implantation technology

- Low temperature surface treatment: bulk materials initial properties are preserved
- No coatings: unpealable surface as the material itself is modified in its depth
- Parts geometry respected: no machining resumption
- Precise and localized surface treatment: optimized process time and final technical performances optimized
- Electrical conductivity is not necessary: any insulating materials might be treated
- Environmentally friendly dry process: no chemical waste

FEATURES

- Faraday's cup for each ionGun2000 integrated in the process chamber
- Fully automatized with intuitive HMI

Ion Implantation

TESTED PROCESSES

Common for all systems using the ionGUN ion implantation technology

Steels: surface hardening (x4 for stainless steels), strong decrease of the friction coefficient and exceptional abrasive wear resistance.

Stainless 316L: from 400 to 1800 Hv on 10µm with digressive profile, friction coefficient divided by 2, pitting resistance multiplied by 10.

Aluminium: surface hardening (x7), strong decrease of the friction coefficient, higher corrosion resistance. Copper and copper alloys: strong resistance to oxidation and abrasive wear, surface hardening (x4).

Gold: surface hardening (x7), increased densities, strong decrease of porosity of electroplated layers.

Titanium: surface hardening (x7), decrease of the friction coefficient. Magnesium: surface hardening (x3), cracking resistance and higher corrosion resistance.

ionPOWDER

Ion Implantation and coatings for powders. This newly developed system allows the treatment of loose parts and powders. Using the ionGUN ion implantation system aand PVD and PECVD processes it allows the use of new alloys with rare elements, core shells hybrid structure, nano structuration to reach enhanced properties of commercial low cost powders.

ionPOWDER 100

Fully integrated automated control system

Technical Data	
Dimensions:	l 260 cm x w 90 cm x h 250 cm
Weigth:	750 kg
Max. substrate size:	30 g powder max
Number of ion guns used:	1
Number and type of optional other coating sources:	1 PVD cathode in option
Type of water cooling system:	Demineralized Water
Basic vacuum pressure:	specific pumping system compatible with powders to reach 10^{-6} mBar within one hour

Ion Implantation

ionPRO

The ionPRO system allows the treatment of large area substrates with the same technologie as the ionLAB system. The optional PVD module allows the combination of the innovative ionGUN ion implantation technology with classical sputtering processes.,

ionPRO 1800

FEATURES

Lock chamber allowing continuous treatment in the process chamber

Fully integrated automated control system

Technical Data / Dimensions	
Dimensions:	l 13 m x w 7,5 m x h 3 m
Weigth:	2800 kg
Max. substrate size:	XY table to allow treatments on 1800 x 1600 mm samples up to 150 mm/s
Number of ion guns used:	5 ionGun2000
Number and type of optional other coating sources:	2 cathodes and 1 ion source in the coming months
Type of water cooling system:	Demineralized Water integrated on the machine
Basic vacuum pressure:	10^{-7} mbar in MAP / 10^{-6} in Chamber

APPLICATION FIELDS

Common for all systems using the ionGUN ion implantation technology

Automotive: increased wear resistance and lowered friction coefficient of mechanical components avoiding the appearance of micro-cracks.

Aeronautics: hard chromium alternative, enhanced resistance of super-alloys oxidation, ice-phobic, elimination of the electro-statics loads, better reliability of the electrical connectors.

Connectors: increased corrosion resistance and densification of the noble metals, better performances with thinner metallic layers.

Elastomers and polymers: lower friction coefficient and higher wear resistance and hardness- antistatic effects due to lower electrical insulation.

Matchmaking – Jewellery: enhanced scratch resistance keeping the brightness and gloss, increase of the overall mechanisms life.

Rotatable Magnetrons by SCI

Sputtering Components, Inc. is the leading global provider of reliable and affordable rotatable cathodes, complete e-Cathode™ lid systems and magnetics featuring state-of-the-art technology. All SCI products are designed to enable the end user to perform quick and inexpensive maintenance work.

robeko is the exclusive sales and service rep in Germany, the surrounding countries and Italy.

Internal Mount End Blocks

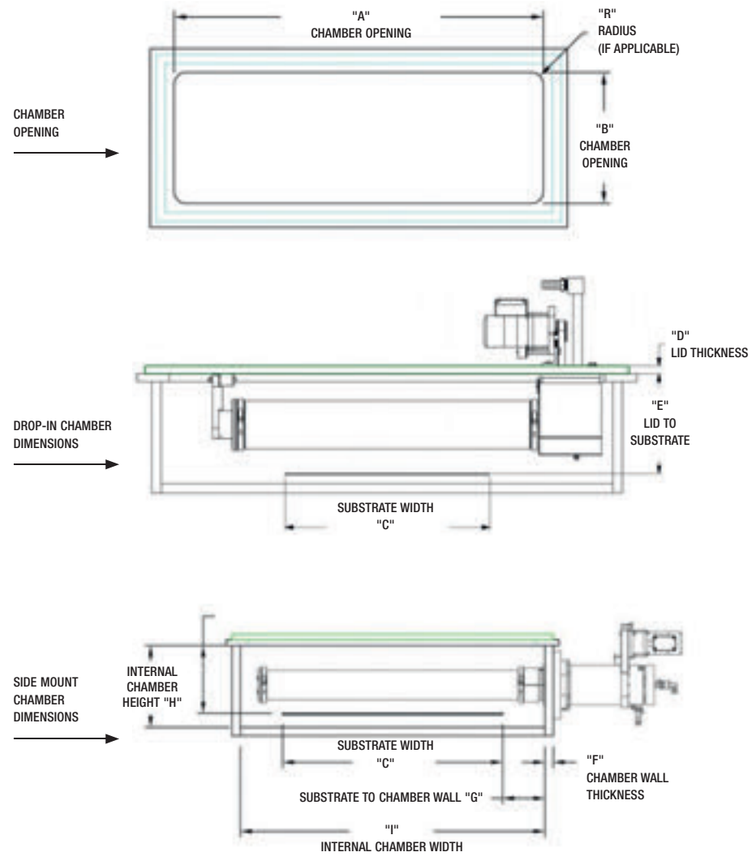
SCI internal mount end blocks have high reliability and a simple, easy-to-maintain design. They are available in three different models – varying in size and power. The single-ended design reduces the number of rotary and static seals, one of the most common failure modes in rotary cathodes.

Our unique water fill and drain feature allows improved target cooling and full draining of the target water on blow down. The design eliminates the possibility of galvanic corrosion inside the end block, which could lead to water leaks and short circuits. Sputtering Components' internal mount end blocks can be installed on any new coater or can easily replace your old end blocks.

External Mount End Blocks

SCI external mount end blocks are small enough for modern thin film solar cell machines, yet powerful enough for the world's largest architectural glass coaters. The external mount end blocks are using the same patented technology as the internal mount end blocks.

Internal (Drop In) vs. External (Side) mount end block System Geometry



NEW SYSTEM INSTALLATIONS

- Available as individual end blocks, end block plus the TRM-Bar™, QRM-Bar™, mQRM-Bar™ magnetics or complete e-Cathode™ systems ready to install

UPGRADE PLANARS TO ROTARIES

- Increase the output and quality of your existing coater without adding chambers
- Coater modification and integration support available

PVD Sources

BENEFITS

- Highest reliability on the market
- Easy to install
  Retrofit from competitor endblocks
- Fastest target change available
- 1 hour annual maintenance
- 3 hour total end block rebuild
- Lowest maintenance costs
- Use targets from any vendor
- No inductive heating impact - no brush dust
- No galvanic corrosion

SC-Series Internal Mount End Block

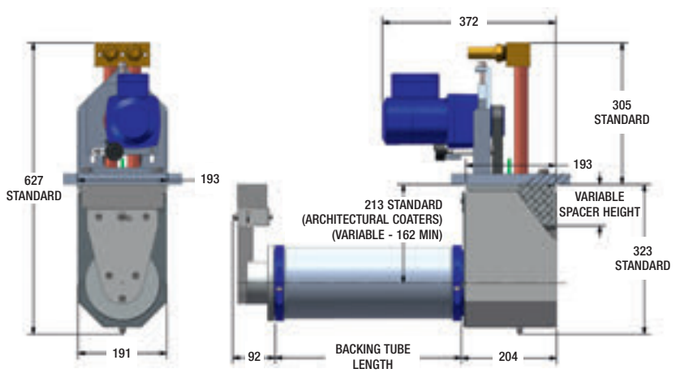
The industry-standard size SC-Series, internal mount end block is the lowest cost, highest power, and most reliable end block available.

FEATURES

- Patented power-delivery technology
- Unique target attachment method
- Durable, long-life rotary seals
- Industry standard mounting to lid
- Non-proprietary target design
- Patented target water fill/drain feature

TECHNICAL DATA

Power	Up to 200 kW DC or 80 kHz MFAC
V/A	1000 V/450 A
Target	Up to 4000 mm
Average weight	40 kg



PVD Sources

BENEFITS

- Highest reliability
- Easy to install
- Fastest target change available
- 1 hour annual maintenance
- 3 hour total end block rebuild
- Lowest maintenance cost
- Use targets from any vendor
- No inductive heating impact - no brush dust
- No galvanic corrosion

MC-Series Internal Mount End Block

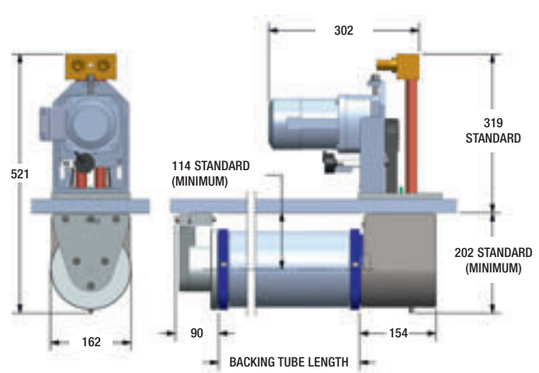
The MC-Series, internal mount end block provides high performance and reliability in a compact design.

FEATURES

- Patented power-delivery technology
- Unique target attachment method
- Durable, long-life rotary seals
- Compact design
- Non-proprietary target design
- Patented target water fill/drain feature

TECHNICAL DATA

Power	Up to 100 kW DC or 80 kHz MFAC
V/A	1000 V/225 A
Target	Up to 2500 mm
Average weight	20 kg



PVD Sources

BENEFITS

- Highest reliability on the market
- Easy to install
  Retrofit from competitor endblocks
- Fastest target change available
- 1 hour annual maintenance
- 3 hour total end block rebuild
- Lowest maintenance costs
- Use targets from any vendor
- No inductive heating impact - no brush dust
- No galvanic corrosion

cMC-Series Internal-Mount End Block

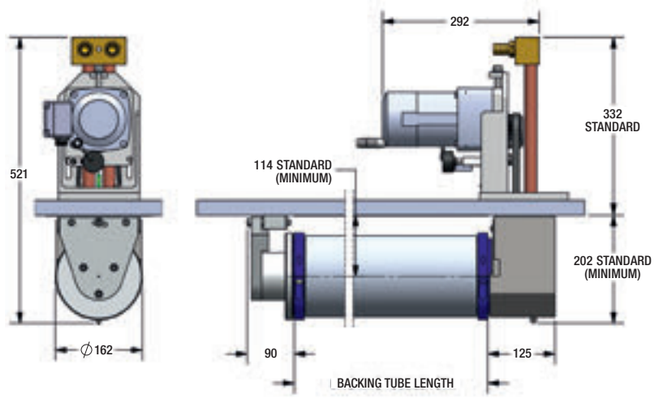
The cMC is designed to directly replace the competitors compact end block or to use in new systems. Upgrade from planar systems to increase the output and quality of your existing coater.

SCI can provide coater integration support.

- Patented power-delivery technology
- Unique target attachment method
- Durable, long-life rotary seals
- smallest footprint using 125 mm ID industry standard target tubes
- Non-proprietary target design
- Patented target water fill/drain feature

TECHNICAL DATA

Max. Power	80 kW DC or MFAC
V/A	1500 V/180 A
Max. Target Length	2000 mm
Maintenance	1 hr./yr. average 3 hrs. for a rebuild



PVD Sources

BENEFITS

- Highest reliability
- Easy to install
- Fastest target change available
- 1 hour annual maintenance
- 3 hour total end block rebuild
- Lowest maintenance cost
- Use targets from any vendor
- No inductive heating impact - no brush dust
- No galvanic corrosion

CC80-Series Internal-Mount End Block

With its extremely compact package, the CC80 is designed for 80 mm ID targets, making it an excellent choice for small systems or R&D systems.

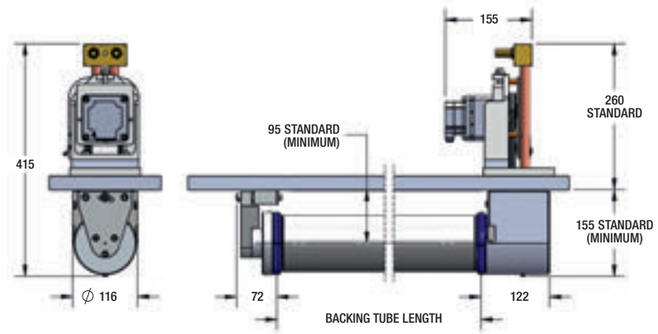
Use in new systems or upgrade from planar systems to increase the output and quality of your existing coater.

SCI can provide coater integration support.

- Patented power-delivery technology
- Unique target attachment method
- Durable, long-life rotary seals
- Smallest footprint featuring the 80 mm ID target design
- Non-proprietary target design
- Patented target water fill/drain feature

TECHNICAL DATA

Max. Power	20 kW DC or MFAC
V/A	1500 V/50 A
Max. Target Length	1000 mm
Maintenance	1 hr./yr. average 3 hrs. for a rebuild



PVD Sources

BENEFITS

- Excellent reliability
- Simple to install
- Fast target change
- 2 hour annual maintenance
- 3 hour total end block rebuild
- Very low maintenance cost
- Use targets from any vendor
- No inductive heating impact - no brush dust
- No galvanic corrosion
- No special target size needed

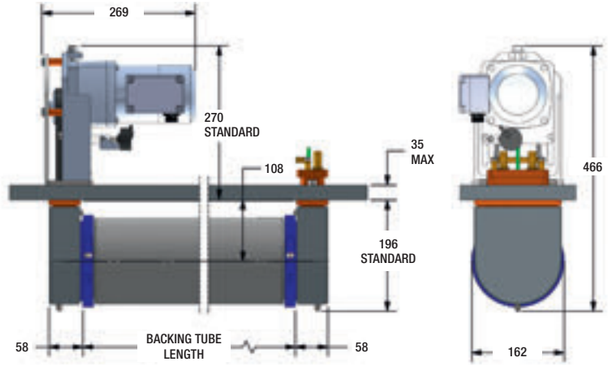
TC-Series Internal-Mount End Block

The TC-Series, internal mount end block combines high-performance and reliability in our most compact design.

FEATURES

- Patented power-delivery technology
- Unique target attachment method
- Durable, long-life rotary seals
- Most compact design available
- Non-proprietary target design
- Patented target water fill/drain feature
- Fits standard target sizes

TECHNICAL DATA	
Power	Up to 40 kW DC or 80 kHz MFAC
V/A	1000 V/100 A
Target	Up to 1500 mm
Average weight	10 kg



PVD Sources

SM-Series External End Block

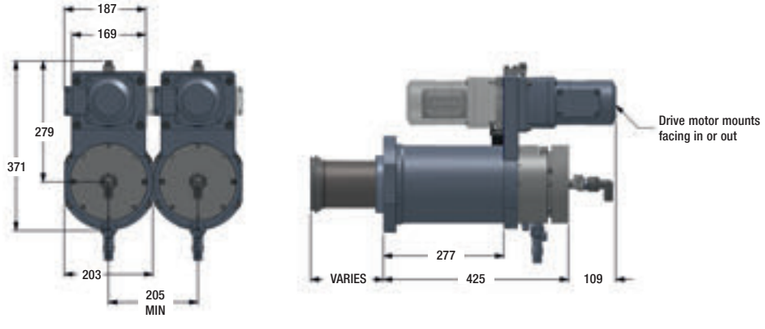
The SM-Series external mount end block uses the same patented technology as our SC-Series end block to deliver outstanding value, performance and reliability.

FEATURES

- Customizable drive shaft length
- Compact and flexible form factor
- Easy access water seal cartridge
- Patented power-delivery technology
- Simple design - fewer parts and highly reliable
- Magnet bar externally adjusts to any angle
- Patented target water fill/drain feature

BENEFITS

- Wider substrate coverage than traditional internal end blocks
- Fits most chamber designs
- All utilities are external and remain attached during target changeover
- High-packing density, dual cathodes in 400 mm space
- Drive motors mount up, down, inward or outward
- High-power with no inductive heating impact no brush dust
- Simple in-house maintenance
- Allows co-sputtering, tighter plasma coupling and limits shield coating



TECHNICAL DATA	
Power	Up to 200 kW DC or 80 kHz MFAC
V/A	1500 V/450 A
Target	Up to 4000 mm
Average weight	60 kg

PVD Sources

BENEFITS

- All utilities are external
- Utilities remain attached during target changeover
- Wider substrate coverage than traditional internal end blocks
- Fits most chamber designs
- High-power with no inductive heating impact - no brush dust
- High-packing density; dual cathodes in 350 mm space
- Drive motors mount up, down, inward or outward
- Simple, in-house maintenance
- Allows co-sputtering, tighter plasma coupling, and limits shield coating

MM-Series External End Block

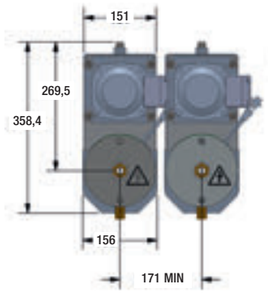
The MM-Series external mount end block uses the same patented technology as our MC-Series end block to deliver outstanding value, performance and reliability in a compact design.

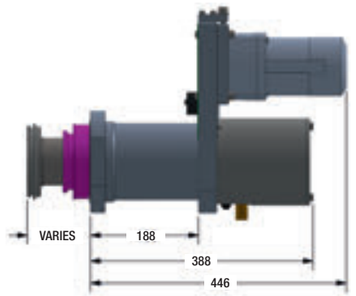
FEATURES

- Customizable drive shaft length
- Compact and flexible form factor
- Easy access water seal cartridge
- Patented power-delivery technology
- Simple design - fewer parts and highly reliable
- Magnet bar externally adjusts to any angle
- Patented target water fill/drain feature

TECHNICAL DATA

Power	Up to 100 kW DC/80 kHz MFAC
V/A	1500 V/225 A
Target	Up to 2500 mm
Average weight	30 kg





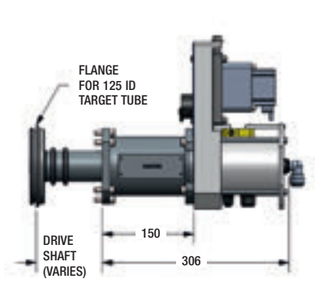
PVD Sources

CM-Series External End Block

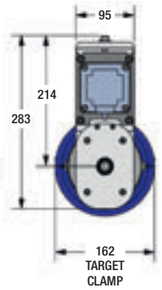
The CM-Series external end block combines high-performance and reliability in a very compact and lightweight design. Available also with smaller mounting flange for 80 mm ID target. Therefore the CM end block fits perfectly for systems with smaller space requirements.

FEATURES

- Customizable drive shaft length
- Ultra compact and flexible form factor
- Easy access water seal cartridge
- Simple design - fewer parts and highly reliable
- Magnet bar externally adjusts to any angle
- Patented target water fill/drain feature
- Fits industrial standard 125 mm ID target sizes or smaller, 80 mm size



95mm MINIMUM DRIVE SHAFT WITH A 20mm WALL (36mm MINIMUM WITH SPECIAL PARTS)



100 mm for 80 mm ID target

BENEFITS

- All utilities are external
- Utilities remain attached during target changeover
- Wider substrate coverage than drop-in end blocks
- Fits most chamber designs
- Excellent power capability with no inductive heating impact - no brush dust
- High-packing density; dual cathodes in 220 mm space with an 80 mm ID target tube
- Drive motors 360° positioning
- Simple, in-house maintenance
- Allows co-sputtering, tighter plasma coupling, and limits shield coating

TECHNICAL DATA

Power	Up to 20 kW DC or 80 kHz MFAC
V/A	1500 V/50 A
Target	Up to 1000 mm
Average weight	15 kg

BENEFITS

- Ideal for display or 3D part coating
- High-packing density, dual cathodes in a 400 mm space
- All utilities are external and remain attached during target changeover
- High power with no inductive heating impact
- No brush dust
- Simple, in-house maintenance
- Coater is kept dry during target changes

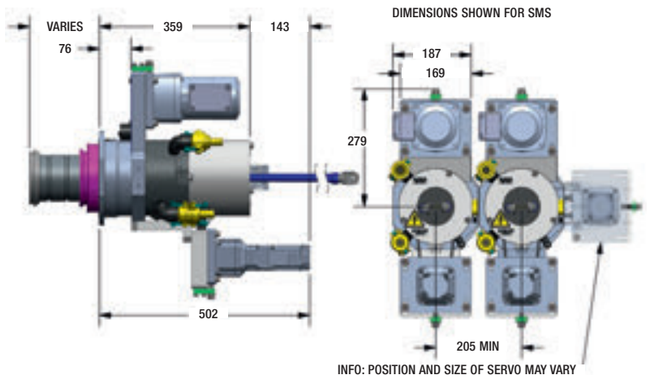
Swing Cathode Model SMS (also MMS & CMS)

The Swing Cathode end block uses the same patented technology as our SM-Series and MM-Series end block to deliver outstanding value, performance and reliability.

Also available with CM-Series and blocks.

FEATURES

- Designed to coat static substrates using a programmable magnet pack with swing motion
- Customizable drive shaft length
- Compact and flexible form factor
- Easy access water seal cartridge
- Patented power-delivery technology
- Simple design - fewer parts
- Patented target water fill/drain feature



TECHNICAL DATA

Power	Up to 200 (100) kW DC/80 kHz MFAC
V/A	1500 V/450 (225) A
Target	Up to 4000 mm (2500 mm)
Average weight	15 kg

PVD Sources

Swing-Duo™ Software

Swing-DUO™ (Dynamic Uniformity Optimization) software is designed to simulate the combined cathode array uniformity for individually optimized motion profiles used to control the motion of the SCI magnet bars when used with our exclusive Swing Cathode™.

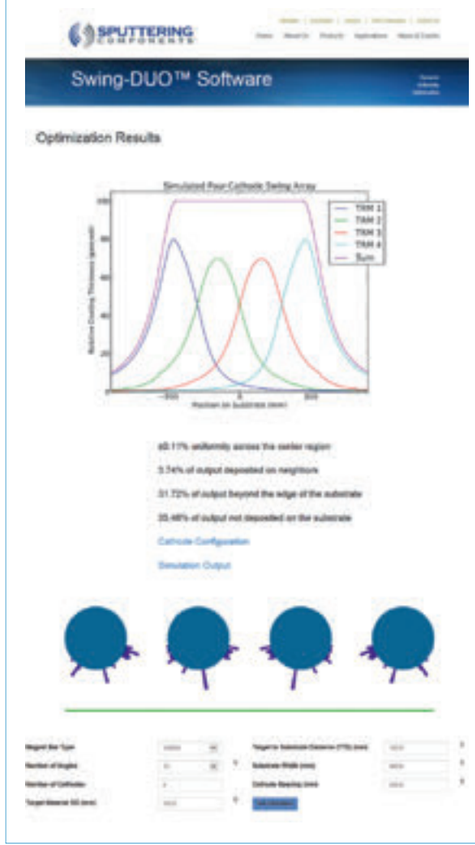
FEATURES

- Dwell-based simulation finds the key deposition angles and calculates the amount of time required at each angle.
- Outputs a CAM table for simplified servo programming - angle and time format
- Uniformity optimization for constant power or variable power
- Uniformity optimization refinement using actual measured uniformity results
- Allows customers to determine the amount of wasted material not deposited on the substrate as a function of the motion profiles
- Simple and easy to use web-based interface

BENEFITS

- Quickly design coater configurations for optimal uniformity of deposition
- Uniformity compensation for systemic issues in the form of motion profile changes.
- Prevent uniformity drift over the life of the target by creating multiple CAM tables for different target diameters.

Simulated Four Cathode Swing Array



For a link to the demonstration video, choose the Swing-DUO™ software from the online products page at sputteringcomponents.com Members of the SCI website can run the software using the following web address:
http://swingduo.sputteringcomponents.com

Customers will experience improved coating efficiencies in the large area and high aspect ratio coating industries.

PVD Sources

BENEFITS

- Industry leading coating uniformity up to +/- 1%
- Superior target utilization and reduced cross corner effects
- High deposition rates
- Lengthen campaign - decrease downtime and increase productivity
- Adjustable sputter angle
- Most versatile rotary magnet systems available
- Custom length magnet bars to ensure the perfect match for your system
- Designed to adapt to other end block styles
- Reduce maintenance costs due to magnet, roller, and bushing replacement
- Increase process yields by reducing process drift
- Increase target utilization and save on target costs

Advanced Magnetics

Our Magnetics are designed to provide high quality, uniform coatings for your application.

FEATURES

- Multiple designs to fit your application requirements
- Advanced magnetics designed using 3D finite element analysis software
- High-strength magnets that are categorized in-house according to gauss level
- Fully encapsulated magnets and robust construction for many years of troublefree operation
- Long-life, multi-roller system for sputter up, sputter down, or off-angle sputtering
- Simple magnetic uniformity tuning
- Easily installed in any possible orientation

Magnetics

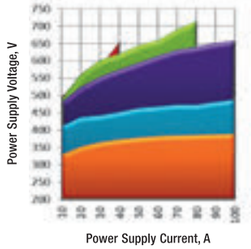
Model	Max Target Diameter	Sputter Angle	Target Mater Utilization	Application
TRM	160 mm	± 12°	> 70% / > 80%*	Thin Targets, Acceptable for most material
mQRM	170 mm	± 15°	> 85%	Thicker Targets, High Utilization
QRM	180 mm	± 21°	> 85%	Thickest Targets, ITO, Electrical Grade Films

All specifications are for 152 mm OD targets

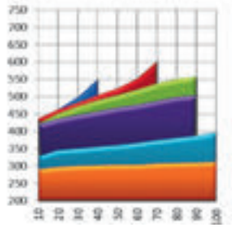
*SCI tapered target required for >80% utilization with the TRM

PVD Sources

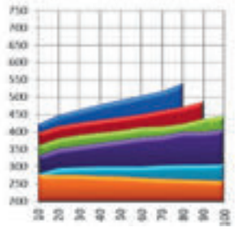
TRM-Bar™



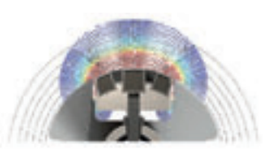
mQRM-Bar™



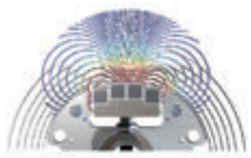
QRM-Bar™



175 mm OD | 165 mm OD | 160 mm OD | 155 mm OD | 145 mm OD | 135 mm OD



- Small magnet, 3-row design
- Narrowest deposition profile minimizes coating loss to shields
- Multiple turn-around design options specific to your application
- Easy change turn-arounds
- Target diameters up to 160 mm OD



- Small magnet, 4-row design
- Patented staggered turn-around design
- Improved performance and reduced impedance
- Stable plasma impedance over the life of the target
- Increased target diameter up to 170 mm OD

- Large magnet, 4-row design
- Patented staggered turnaround design
- Improved performance
- Best plasma impedance stability over the life of the target
- Largest target diameter up to 180 mm OD

PVD Sources

SRM80-Bar™
TRM80-Bar™

Designed specifically for the CC80-Series internal-mount end block and the CM80-Series external-mount end block, the SRM80-Bar™ and TRM80-Bar™ are for use with an 80 mm ID target tube.

Their narrow deposition profile minimizes coating loss to shields.

SRM Field

TRM Field

Model	Max. Target Diameter	Sputter Angle	Target Material Utilization	Application
SRM	115 mm	28°	>85%	80 mm ID Targets Accetable for most materials
TRM	115 mm	19°	>85%	80 mm ID Targets Accetable for most materials

PVD Sources

RAM-Bar™ Magnetics

Sputtering Components' Remotely Adjustable Magnet Bar or RAM-Bar™ allows customers to adjust the distance between the magnets and the target surface from outside the system during operation.

FEATURES

- Self-contained system that utilizes fiber optics for control
- Compatible with SCI's TRM-Bar™, mQRM-Bar™ and QRM-Bar™magnet bars
- Achieve film thickness uniformity of better than +/-1%
- Movement accuracy of +/- 50µm over the full 20mm range of motion
- Allows for up to 4mm vertical difference between adjustment locations
- Robust industrial communication via ethernet gateway
- Control multiple magnet bars through a dedicated PC
- Easy-to-use, operational software

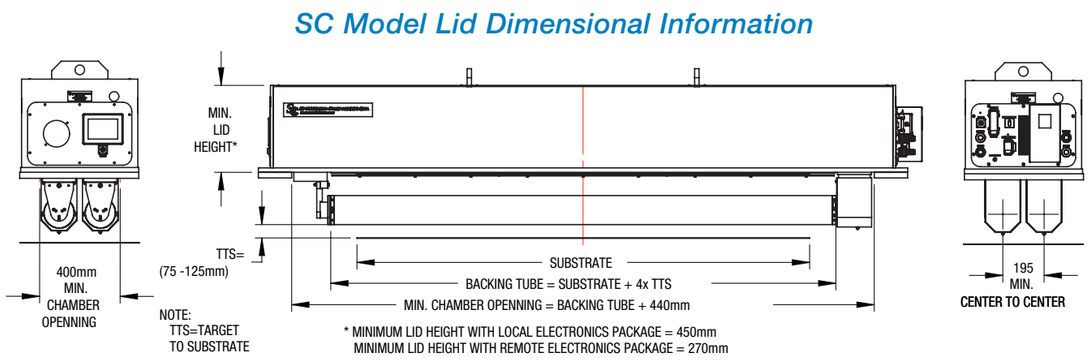
BENEFITS

- In-situ uniformity and position adjustments eliminates costly system shutdown.
- Constant impedance mode can reduce process drift and help stabilize the deposition rate throughout the lifetime of the target materials
- The batteries are standard rechargeable Li-Ion packs that can quickly and easily be swapped out.
- Very fine tuning for the most demanding uniformity requirements.

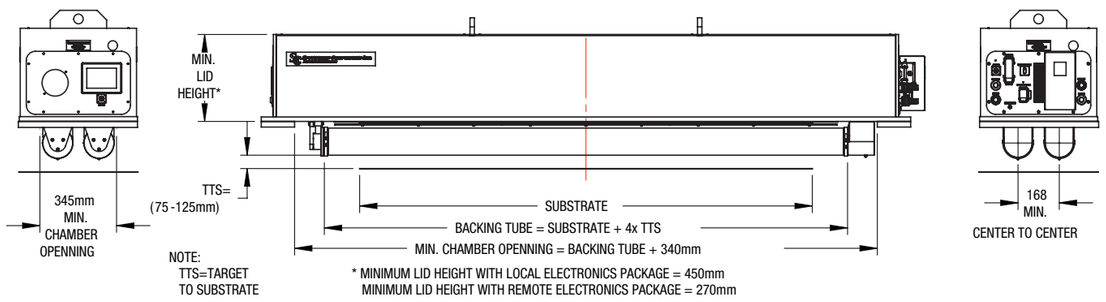
TECHNICAL DATA	
Min BT Length	1 m
Max Target Diameter	180 mm
Adjuster Pitch	12" / 305 mm
Adjustable Uniformity	<+/- 1% depending on application
Application	Optical Thin Films with Tight Uniformity Requirements

PVD Sources

SC Model Lid Dimensional Information



MC Model Lid Dimensional Information



e-Cathode Lids

The e-Cathode™ is a complete cathode solution. SCI e-Cathode™ systems are available in digital and analog styles and are adaptable to meet your needs.

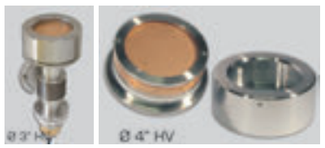
SCI provides OEM equipment builders complete turn-key solutions, ready to interface with their systems. SCI can customize these solutions to provide as much controls integration as desired onboard the e-Cathode™. End users seeking to add additional cathodes to their system look to SCI for plug-and-play solutions. Our e-Cathode clones match all your current external mechanical and electrical interfaces but use SCI end blocks, magnet bars, and cathode control systems.

E-CATHODE LIDS			
Feature	**Digital e-Cathode™**	**Analog e-Cathode™**	**Basic e-Cathode™**
Onboard logic	PLC	Relay	None
Interlocks	Full	Full	HV only
Control	Local (touch screen) Remote (Ethernet, Profibus, DH+)	Local (light, switches) Remote (discrete I/O)	All sensors wired to the connector
Water Flow	Flow rate indicator	Flow switch	Customer supplied, external
Water Temperature Option	Yes	No	No
Onboard MFC Option	Yes	No	No
Differential Pumping Option	Yes	Yes	Yes
Monitoring	Real time and advanced parameter	Basic parameter	Real time

THIN FILM CONSULTING

IONIX

MAGNETRON SPUTTERING TECHNOLOGY



Planar Magnetrons by THFC

The unique IONIX® magnetron sputtering sources have a flexible architecture to cope with the partially contradicting performance requirements of modern vacuum coating technology. The IONIX® concept is based on maximum reliability, adaptable magnet array layout and versatile design to fit with customer's specific applications.

Since January 2017 robeko is sales agent for Thin Film Consulting.

High Vacuum Round Magnetrons

For R + D and small scale production

IONIX® round magnetrons are available in target diameters of 1.25" to 10" and include standard KF/ISO interfaces for use with virtually any type of vacuum chamber installation.

UHV Round Magnetrons

For scientific research

IONIX® UHV magnetrons are available in target diameters of 1" to 8". Rectangular UHV sources are available on request.

- Metallic sealing vacuum-to-air
- No seals vacuum-to-water
- Bakeable 200°C
- Flange mount and internal mount design

Flange Mount Magnetron Assy's

IONIX® flange assemblies plug-in solutions:

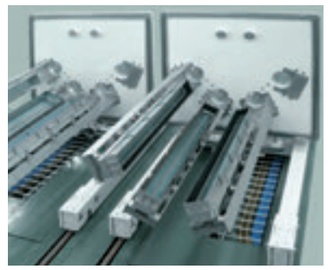
- Target Ø 1" - Ø 6" HV and UHV
- Pneumatic shutter
- Argon distribution
- Z-adjustment
- +/- 45° tilt
- DN 100 ISO - DN 200 ISO
- DN 63 CF bis DN 200 CF

PVD Sources

Rectangular Magnetrons

IONIX® rectangular magnetron sputtering sources with advanced water cooling circuits are designed for industrial production purposes, offering:

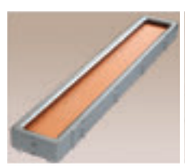
- High-reate metallic sputtering
- RF sputtering of dielectric targets
- Pulsed reactive mode sputtering for high rate
- Deposition of dielectric thin films

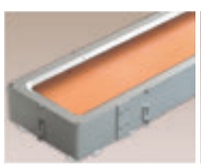


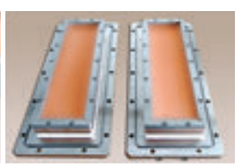
Advanced water cooling

Directed cooling water flow and multipolar magnet arrays accomodate the use of clamped targets at power levels of 20W/cm2 (Cr, Al) and above.

Rectangular Magnetrons				
Target width "A"	**Target length "B"**	**Cathode width "C"**	**Cathode length "D"**	**Height "H"**
63 mm / 2,5"	300 ... 1000 mm	102 mm	„B" + 40 mm	64 mm
89 mm / 3,5"	300 ... 1000 mm	135 mm	„B" + 47 mm	75 mm
100 mm / 4"	300 ... 1000 mm	147 mm	„B" + 47 mm	66 mm
127 mm / 5"	300 ... 2000 mm	172 mm	„B" + 47 mm	71 mm
152 mm / 6"	300 ... 2000 mm	205 mm	„B" + 57 mm	80 mm
200 mm / 8"	300 ... 3000 mm	265 mm	„B" + 75 mm	84 mm







Magnet Array Options

1. Standard magnet arrays

- Extended film homogeneity
- High rates
- Target utilization 30 - 35 %
- Stable operation in AC and RF mode

2. Multi-polar magnet arrays

- Target utilization 35 - 45 %

3. Coil assisted magnet arrays

- To unbalance
- Adjust target utilization

4. Low pressure magnet arrays

- p = 7 x 10-4 mbar and below

Process Controllers

P L A S U S

EMICON – Plasma Monitor and Process Control System

- Broadband Spectrum Acquisition
- Multi-Channel And High-Resolution Series
- Real – Time Plasma Emission Monitoring
- Turn Key System For Industrial Applications

Process control is essential in industrial plasma applications to ensure reliability and high quality of the process. Here, optical emission spectroscopy is a first choice technique since it does not affect the plasma and since real-time monitoring of several plasma species is possible. The EMICON system is a plasma monitor system based on optical emission spectroscopy and comes with all the features you need for analyzing, optimizing and controlling your plasma application.

Broad band spectrum acquisition

The fiber optics spectrometers of the system acquire continuously complete spectra of the plasma light emission from 200 up to 1100 nm. (200 – 860 for HR series) The EMICON series features up to 8 independent spectrometer channels necessary e.g. for multi-chamber process control or spatial resolved gas flow control in reactive sputtering applications. Real time monitoring of plasma emission Light emission from process relevant plasma particles is observed simultaneously and tracked in real time. This allows a continuous monitoring of plasma conditions and changes are realized instantaneously.

Process analysis

A full analysis of the plasma process is carried out by reviewing recorded spectra and process data.

Process optimization

Real-time monitoring gives the capability to optimize the plasma process by taking advantage of the instant system response on parameter changes.

Process Controllers

Process control

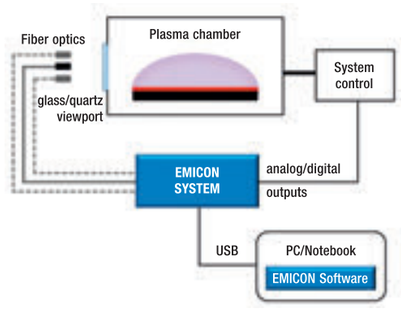
Analog and digital outputs and inputs are available to install open and closed loop control functions. This feature is used for end-point detection or for monitoring deviations from standard plasma process conditions. The integrated PID control function gives direct access to applications where closed loop control is necessary such as gas flow control or power control in reactive sputtering applications

Advanced system software

The system is fully software controlled and all functions are available by one click navigation. The split-screen shows maximum overview of all process relevant data. Special features: recipe manager, set-point alarm, PID control with automatic response curve scaling, DLL remote control, administrator/user mode, etc..

Optics

A variety of optical components are available for collecting the plasma radiation: optical fibers, collimator optics and optical feedthroughs for ex-vacuum and in-vacuum use. All in-vacuum optics comes with a protection device to avoid coating of the optical surfaces.



Spectral data analysis tool

For evaluating and analyzing the recorded spectral data the optional SpecLine software package is available: SpecLine comes with an extensive and unique data base for atoms and molecules which is essential for the identification of plasma species and analysis of the recorded spectra.

EMICON – Plasma Monitor and Process Control System

	EMICON MC Multi-Channel	EMICON HR High-Resolution	EMICON SA Stand-Alone
Number of channels	1 – 8	1	1 – 8
Wavelength range (nm)	200 – 1100	200 – 860	200 – 1100
Spectral resolution (nm)	1.4	0.15	1.5
Signal resolution	16 bit	16 bit	16 bit
Digital in/out	4/4	2/2	8/8
Analog out	8	4	4 – 8
Connectivity	USB 2.0	USB 2.0	LAN/Profibus

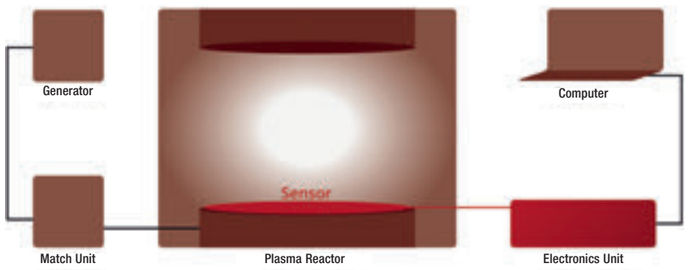
Plasma Diagnostics

Impedans
PLASMA MEASUREMENT

We know plasma…

Impedans specializes in the delivery of high performance and high resolution plasma diagnostics solutions to customers in research and industry. Our products find applications in plasma process research and devleopment, process monitoring and control, and manufacturing tool development in the semiconductor, surface coating, flat panel, thin film and solar sectors. Impedans' products represent the next generation in plasma diagnostics technology, and coupled with our in-depth knowledge and years of experience, our customers can be sure that they can fully characterize, optimize and monitor their plasma process with confidence.

Substrate Level Ion Measurements



Semion | Vertex

Ion Energy Analyser

Ion Energy | Ion Energy Distribution
Ion Flux | Positive/Negative Ion
Electrode Voltage |
Ion Aspect Ratio (Vertex)

Applications
Dusty | Etch | HiPIMS | Ion Beam
PECVD | Space | Sputtering

Plasma Diagnostics

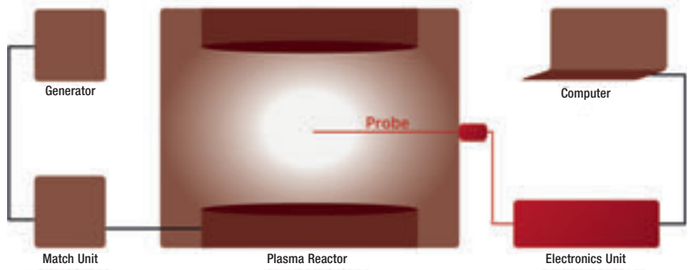
Quantum

Ion Flux Fraction

Deposition Rate | Ion Energy
Ion Flux | Electrode Voltage

Applications
Dusty | Etch | HiPIMS | Ion Beam
PECVD | Space | Sputtering

Bulk Plasma Parameter Measurements



Langmuir

Plasma Parameters

Plasma Potential | Floating
Potential | Ion Current Density
Plasma Density | Electron Energy
Distribution Function

Applications
Dusty | Etch | HiPIMS
PECVD | Space | Sputtering

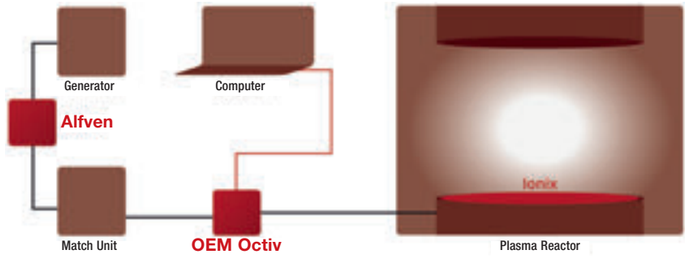
Plasma Diagnostics

Plato
Deposition Tolerant Probe

Plasma Density | Ion Current Density
Electron Temperature

Applications
Dusty | Etch | HiPIMS | PECVD
Space | Sputtering

Plasma Process Monitoring



OEM Octiv
Integrated VI Probe

Voltage | Current | Phase
Impedance

Applications
Etch | Deposition | Medical
RF Heating | Plasma Power
Applications

Ionix
Wireless Ion Meassurement

Average | Ion Energy | Ion Flux
IEDF

Applications
Etch | PECVD | Ion Beam
Sputtering

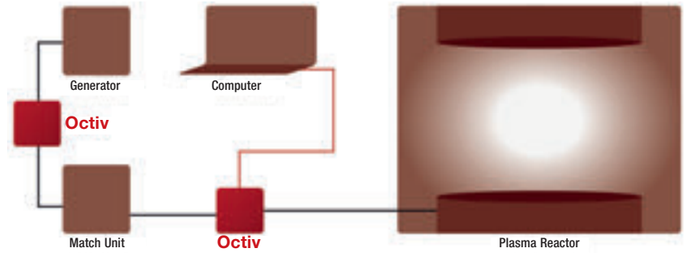
Alfven
Plasma Arc Detector

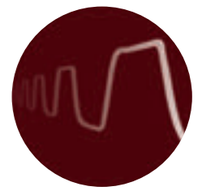
Voltage | Current
Pulse Monitoring | Microarcs

Applications
Etch | Deposition
Medical | RF Heating
Sterilisation | PECVD

Plasma Diagnostics

RF Plasma Power Measurement





Octiv Suite
VI Probe

Voltage | Current | Phase
Impedance | Pulsed Capability

Applications
Atmospheric | Dusty | Etching
PECVD | Space | Sputtering

Octiv Mono
Impedance RF Power Sensor

Forward Power | Reflected Power
Impedance | Smith Charts

Applications
Atmospheric | Dusty | Etching
PECVD | Space | Sputtering

Octiv Poly
VI Probe

Voltage | Current | Phase
Impedance | Harmonics | Ion Flux
Waveform Reproduction

Applications
Atmospheric | Dusty | Etching
PECVD | Space | Sputtering

Power Supplies & Generators

MAGPULS Pulse Generators

Magpuls Pulse Generators provide highest flexibility and supreme performance for plasma nitriting processes, bias applications and magnetron sputtering including ambitious reactive and HIPIMS processes.

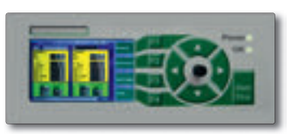
The MAGPULS Unipolar and Bipolar Pulse Generator series MP 1, MP 2 and MP 2 – HC are constructed in two separate units. One unit is the DC generator which provides the DC power into the big capacitor bank of the pulse unit and the pulse unit with the integrated sophisticated ARC management.

The MP 2 – AS family follows the same design principle, but needs two separate DC generators to make the asymmetric pulse feature possible.

Depending on model and application the generators are available with peak currents of up to 1500 A (MP 2 – HC) and with up to 8 adjustable pulse wave forms (MP 2 – AS). The DC power is in the range of 6 – 75 kW. Higher power available upon request.

The duty cycle can be adjusted within the range from !0.002% up to 99.998% and for the bipolar MP 2 family is individually adjustable for each half wave. The new MAGPULS enhanced ARC management provides best coating results without process interruptions.

Optional all MAGPULS generators are provided with an external optical input interface for external controlling of the pulse times as well as an optical output interface for triggering or synchronization of other unipolar or bipolar pulse generators of the MP 1 and MP 2 series.



COMMON FEATURES

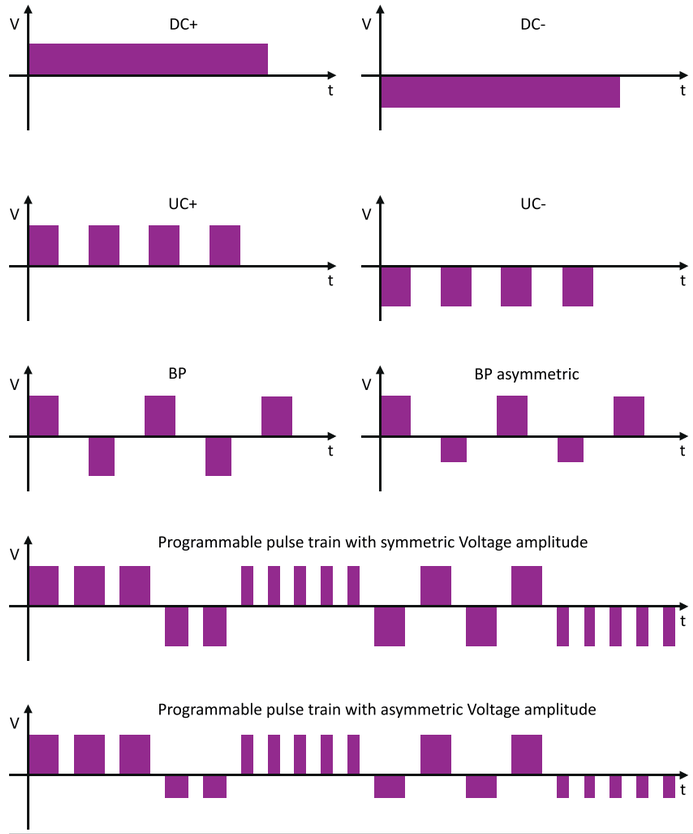
- Up to 8 different operating modes depending on model including DC mode.
- Adjustable pulse parameters and frequency
- Enhanced Arc Management

COMMON BENEFITS

- Universal Application range with one generator
- Optimum adjustment of process and high process stability.
- Best Arc suppression and lowest Arc energy for best performance

Power Supplies & Generators

Up to 8 adjustable pulse wave forms



Overview

Mode*	DC+	UP+	DC-	UP-	BP	BP-AS	PPT	PPT-AS
Pulse Generators Type								
MP 1 Unipolar	✓	✓	-	-	-	-	-	-
MP 2 Bipolar	✓	✓	✓	✓	✓	-	✓	-
MP 2 – AS Bipolar Asymmetric	✓	✓	✓	✓	✓	✓	✓	✓
MP 2 – HC Bipolar HIPIMS	✓	✓	✓	✓	✓	-	✓	-

*refer to diagram above, AS = asymmetric, PPT = programmable pulse train, ✓ = mode available

MP 1 – Unipolar Pulse Generators

Output					
	MP1-35	**MP1-60**	**MP1-100**	**MP1-200**	**MP1-400**
Voltage	0 – 1000 V				
Current	0 – 10 A DC 0 – 35 A Puls	0 – 20 A DC 0 – 60 A Puls	0 – 40 A DC 0 – 100 A Puls	0 – 80 A DC 0 – 200 A Puls	0 – 150 A DC 0 – 400A Puls
Power	0 – 6 kW DC	0 – 10 kW DC	0 – 20 kW DC	0 – 40 kW DC	O – 75 kW DC
Pulse frequency	DC / 0.05 Hz – 100 kHz				DC / 0.05 Hz – 75 kHz
Max. frequency with Max. pulse current	100 kHz @ 10 A 25 kHz @ 35 A	100 kHz @ 25 A 40 kHz @ 60A	100 kHz @ 25 A 20 kHz @ 100 A	100 kHz @ 50 A 20 kHz @ 200 A	75 kHz @ 100 A 20 kHz @ 400
Pulse time settings T on	2.0 µs up to 100 sec				
Pulse wave form	DC / Unipolar pulsed				

Input					
Max. Voltage	0 – 1000 V				
Max. Current	0 – 10 A DC	0 – 20 A DC	0 – 40 A DC	0 – 80 A DC	0 – 150 A DC
Max. Power	0 – 6 kW DC	0 – 10 kW DC	0 – 20 kW DC	0 – 40 kW DC	O – 75 kW DC
Mains supply	1 AC 230 V, 50/60 Hz or 1 AC 115 V, 50/60 Hz				

Power Supplies & Generators

MP 2 – Bipolar Pulse Generators

Output					
	MP2-35	**MP2-60**	**MP2-100**	**MP2-200**	**MP2-400**
Voltage	0 – 1000 V				
Current	0 – 10 A DC 0 – 35 A Puls	0 – 20 A DC 0 – 60 A Puls	0 – 40 A DC 0 – 100 A Puls	0 – 80 A DC 0 – 200 A Puls	0 – 150 A DC 0 – 400 A Puls
Power	0 – 6 kW DC	0 – 10 kW DC	0 – 20 kW DC	0 – 40 kW DC	O – 75 kW DC
Pulse frequency	DC / 0.05 Hz – 100 kHz				DC / 0.05 Hz – 75 kHz
Max. frequency with Max. pulse current	100 kHz @ 10 A 25 kHz @ 35 A	100 kHz @ 25 A 40 kHz @ 60A	100 kHz @ 25 A 20 kHz @ 100 A	100 kHz @ 50 A 20 kHz @ 200 A	75 kHz @ 100 A 20 kHz @ 400
Pulse time settings T on+ T on- T off+ T off-	2.0 µs up to 100 sec				
Pulse wave form	DC+ / DC- / Unipolar pulsed + / Unipolar pulsed - / Bipolar pulsed / programmable pattern				

Input					
Max. Voltage	0 – 1000 V				
Max. Current	0 – 10 A DC	0 – 20 A DC	0 – 40 A DC	0 – 80 A DC	0 – 150 A DC
Max. Power	0 – 6 kW DC	0 – 10 kW DC	0 – 20 kW DC	0 – 40 kW DC	O – 75 kW DC
Mains supply	1 AC 230 V, 50/60 Hz or 1 AC 115 V, 50/60 Hz				

Power Supplies & Generators

MP 2 – AS Asymmetric Bipolar Pulse Generators

Output					
	MP2-AS-35	**MP2-AS-60**	**MP2-AS-100**	**MP2-AS-200**	**MP2-AS-400**
Voltage	0 – 1000 V				
Current	0 – 10 A DC 0 – 35 A Puls	0 – 20 A DC 0 – 60 A Puls	0 – 40 A DC 0 – 100 A Puls	0 – 80 A DC 0 – 200 A Puls	0 – 150 A DC 0 – 400 A Puls
Power	0 – 6 kW DC	0 – 10 kW DC	0 – 20 kW DC	0 – 40 kW DC	O – 75 kW DC
Pulse frequency	DC / 0.05 Hz – 100 kHz				DC / 0.05 Hz – 75 kHz
Max. frequency with Max. pulse current	100 kHz @ 10 A 25 kHz @ 35 A	100 kHz @ 25 A 40 kHz @ 60A	100 kHz @ 25 A 20 kHz @ 100 A	100 kHz @ 50 A 20 kHz @ 200 A	75 kHz @ 100 A 20 kHz @ 400
Pulse time settings T on+ T on- T off+ T off-	2.0 µs up to 100 sec				
Pulse wave form	DC+ / DC- / Unipolar pulsed + / Unipolar pulsed - / Bipolar pulsed / programmable pattern				

Input					
Max. Voltage 1	0 – 1000V				
Max. Voltage 2	0 – 1000 V				
Max. Current 1	0 – 10 A DC	0 – 20 A DC	0 – 40 A DC	0 – 80 A DC	0 – 150 A DC
Max. Current 2	0 – 10 A DC				
Mains supply	1 AC 230 V, 50/60 Hz or 1 AC 115 V, 50/60 Hz				

Power Supplies & Generators

MP 2 – HC Bipolar HIPIMS Pulse Generators

Output					
	MP2-HC 200	**MP2-HC 400**	**MP2-HC 600**	**MP2-HC 1000**	**MP2-HC 1500**
Voltage	0 – 1000 V				
Current	0 – 20 A DC 0 – 200 A Puls	0 – 40 A DC 0 – 4000 A Puls	0 – 60 A DC 0 – 600 A Puls	0 – 100 A DC 0 – 1000 A Puls	0 – 150 A DC 0 – 1500A Puls
Power	0 – 10kW DC	0 – 20 kW DC	0 – 30 kW DC	0 – 60 kW DC	0 – 90 kW DC
Pulse frequency	DC / 0.05 Hz – 100 kHz	DC / 0.05 Hz – 50 kHz			
Max. frequency with Max. pulse current	100 kHz @ 40 A 2 kHz @ 200 A	50 kHz @ 80 A 2 kHz @ 400 A	50 kHz @ 105 A 2 kHz @ 600 A	50 kHz @ 120 A 2 kHz @ 1000 A	50 kHz @ 120 A 2 kHz @ 1500 A
Pulse time settings T on+ T on- T off+ T off-	5.0 µs up to 100 sec				
Pulse wave form	DC+ / DC- / Unipolar pulsed + / Unipolar pulsed - / Bipolar pulsed / programmable pattern				

Input					
Max. Voltage	0 – 1000V				
Max. Current	0 – 20 A DC	0 – 40 A DC	0 – 60 A DC	0 – 100 A DC	0 – 150 A DC
Max. Power	0 – 10 kW DC	0 – 20 kW DC	0 – 30 kW DC	0 – 60 kW DC	O – 90 kW DC
Mains supply	1 AC 230 V, 50/60 Hz or 1 AC 115 V, 50/60 Hz				

Power Supplies & Generators

SEREN Power Supplies

robeko provides products of Seren IPS Inc., a leading manufacturer of RF power delivery components.

At Seren IPS. Inc., innovative technology, applications and design expertise are combined with world class support to deliver critical RF power solutions including RF Generators, Matching Networks and accessories. Continuous product development and dedicated Application/Design Engineering services ensure success for our customers.

Distribution of Seren's products in Europe is performed jointly with RF industries, UK.

Product overview

RF power supplies

- **R & L Series Generators: (Industrial Applications, Sputter/ Etch/Deposition):** 100W – 30KW, 100 kHz – 40.68 MHz
- **"HR" Series Generators: (Semiconductor, Sputter/Etch/ Deposition, ALD):** 600w – 30KW, 100 kHz - 40.68 MHz
- **M Series Generator: (Table Top, Bias Applications):** 125 & 300 Watts @ 13.56 MHz

Matching networks

- **AT Series (Industrial Applications/Sputter/Etch/Deposition):** 100W through 20,000 Watts @ 350 kHz through 40.68 MHz
- **ATS Series (Semiconductor/Sputter/Etch/Deposition/ALD):** 100W through 20,000 Watts @ 350 kHz through 40.68 MHz
- **Matching Transformers Step up / Step Down (50 kHz – 500 kHz):** 1000W through 5,000 Watts

Power Supplies & Generators

SEREN RF-Generators, HR-Series

The Seren HR-2001 is a third-generation, 2000 Watt RF Generator. It may be purchased at 13.56 MHz, 27.12 or 40.68 MHz. This lightweight, water-cooled ½ rack unit is designed to exceed the most stringent vacuum processing demands. The HR-2001 can be used as the sole source for plasma generation, as a Bias generator, or as one of several generators in a multiple generator configuration. Front panel indicators include AC ON, RF On, Alarm and Interlock. An optional Remote controller (front panel controls and indicators) may be purchased.

Seren "HR Series" products incorporate a separate surface mount technology printed circuit board for controls and RF amplifier. The RF amplifier is powered by a switch-mode power supply.

Seren "HR Series" products utilize LDMOS Field-Effect Transistors in the power amplifier stages. The unit operates in a class AB mode providing power accuracy and stability across the entire power range.

COMMON FEATURES

- LDMOS FET's
- CE marked
- Up to 5kW Half rack
- Internal DC Switcher
- High speed pulsing
- Agile frequency tuning
- CEX w/ digital phase shifter

Basic Specifications	
Models	**HR-601/1001/2001/3001/4001/5001/10001**
Forward Power Output	600/1000/2000/3000/4000/5000/10000 Watts 20 & 30 kW models in master slave mode
Frequency	1.7-2.1, 13.56, 27.12, 40.68 MHz
Forward Power Accuracy	+/-2%
Harmonics	-50 dBc
Input Power	190-264, 380-415, 480 VAC, 47-63 Hz, 1 or 3 Phase, depending on model
Output Connector Type	"N", "HN", "LC" or "Din" Female, depending on generator model
Interface Connectors	Serial: DB-9 Female; Analog: DB-25 Female
Pulsing	10 micro sec. / min. pulse
Cooling	Air cooled (HR601/1001), Water cooled (HR2001 to HR30.001)
Dimensions	HR601 – HR5001: ½ 19" rack, HR10001: 19" rack
Weight	Depending on model

SEREN
RF Generators

R Series - High Frequency RF Generators (1.7 – 40.68 MHz)					
Model	**Power**	**Frequency**	**Cooling**	**Mounting**	**H x W x D**
R301	300 W	13.56 MHz	Air	½ Rack	5.25” x 8” x 19”
R601	600 W	13.56 MHz	Air	½ Rack	7” x 8” x 18.5”
R1001	1000 W	13.56 MHz	Air	½ Rack	7” x 8” x 18.5”
R2001	2000 W	1.7 – 2.1 MHz	Water	19” Rack	7” x 17” x 23”

L Series - Low Frequency RF Generators (Additional frequencies available, consult factory)					
Model	**Power**	**Frequency**	**Cooling**	**Mounting**	**H x W x D**
R301	300 W	350 – 460 KHz	Air	½ Rack	5.25” x 8” x 19”
R601	600 W	350 – 460 KHz	Air	½ Rack	7” x 8” x 18.5”
R1001	1000 W	350 – 460 KHz	Air	½ Rack	7” x 8” x 18.5”
R2001	2000 W	350 – 460 KHz	Air	½ Rack	7” x 17” x 23”
R3001	3000 W	350 – 460 KHz	Air	½ Rack	7” x 17” x 23”

HR Series – High Frequency RF Generators (1.7 – 40.68 MHz)					
Model	**Power**	**Frequency**	**Cooling**	**Mounting**	**H x W x D**
M-125	125 W	13.56 MHz	Air	Rack	3.25” x 8” x 10”
HR601	600 W	13.56 MHz	Air	½ Rack	5.25” x 8” x 19”
HR1001	1000 W	13.56 MHz	Air	½ Rack	5.25” x 8” x 19”
HR1201	1,200 W	13.56 MHz	Air	½ Rack	5.25” x 8” x 19”
HR2001	2,000 W	13.56 MHz	Water	½ Rack	7” x 8” x 22”
HR3001	3,000 W	13.56 MHz	Water	½ Rack	7” x 8” x 22”
HR4001	4,000 W	13.56 MHz	Water	½ Rack	7” x 8” x 22”
HR5001	5,000 W	13.56 MHz	Water	½ Rack	7” x 8” x 22”
HR6001	6,000 W	13.56 MHz	Water	19” Rack	7” x 17.2” x 29”
HR10,001	10,000 W	13.56 MHz	Water	19” Rack	8.25” x 17.2” x 29”
HR20,001	20,000 W	13.56 MHz	Water	19” Rack	29.75” x 17.2” x 34”

Power Supplies & Generators

SEREN
Automatic Matching Networks

AT Series - Automatic matching Networks (1.7 – 40.68 MHz) MC2 Controller Input Power: (90 – 125 or 190 – 250 VAC)					
Model	**Power**	**Rating**	**Cooling**	**Var. Caps.**	**H x W x D**
AT-3	300 W	20 Amps, 2.5 KV	Air	Air/Air	5” x 9” x 15”
AT-6	600 W	30 Amps, 4.5 KV	Water	Air/Vac.	5” x 9” x 15”
AT-10	1000 W	50 Amps @ 9 KV	Air	Vac./Vac.	6” x 13.2” x 13.4”
AT-20	2000 W	65 Amps @ 9 KV	Water	Vac./Vac.	6” x 13.13” x 13.38”
AT-30	3000 W	75 Amps @ 9 KV	Water	Vac./Vac.	6” x 13.13” x 13.38”
AT-50/125	5000 W	120 Amps @ 6 KV	Water	Vac./Vac.	7.5” x 14.7” x 14.4”
AT-50/140	5 – 10 KW	140 Amps @ 6 KV	Water	Vac./Vac.	9.5” x 16.13” x 17”
AT-100/160	10 – 15 KW	160 Amps @ 6 KV	Water	Vac./Vac.	Custom
AT-150/180	15 – 20 KW	180 Amps @ 6 KV	Water	Vac./Vac.	Custom
AT-250/250	15 – 30 KW	250 Amps @ 6 KV	Water	Vac./Vac.	Custom

ATS Series - Automatic matching Networks (1.7 – 40.68 MHz) Input Power: (24VDC @ 3 Amps)					
Model	**Power**	**Rating**	**Cooling**	**Var. Caps.**	**H x W x D**
ATS-3	300 W	20 Amps @ 2.5 KV	Air	Air/Air	5” x 9” x 15”
ATS-6	600 W	30 Amps @ 4.5 KV	Water	Air/Vac.	5” x 9” x 15”
ATS-10	1000 W	50 Amps @ 9 KV	Air	Vac./Vac.	6” x 13.2” x 13.4”
ATS-20	2000 W	65 Amps @ 9 KV	Water	Vac./Vac.	6” x 13.13” x 13.38”
ATS-30	3000 W	75 Amps @ 9 KV	Water	Vac./Vac.	6” x 13.13” x 13.38”
ATS-50/125	5000 W	120 Amps @ 6 KV	Water	Vac./Vac.	7.5” x 14.7” x 14.4”
ATS-50/140	5 – 10 KW	140 Amps @ 6 KV	Water	Vac./Vac.	9.5” x 16.13” x 17”
ATS-100/160	10 – 15 KW	160 Amps @ 6 KV	Water	Vac./Vac.	Custom
ATS-150/180	15 – 20 KW	180 Amps @ 6 KV	Water	Vac./Vac.	Custom
ATS-250/250	15 – 30 KW	250 Amps @ 6 KV	Water	Vac./Vac.	Custom

Targets & Evaporation Materials

Introduction

robeko provides a wide range of high performance thin film coating materials for magnetrons of all manufacturers and a large variety of applications, for example large area coating, precision optics, touch panels, tribological and decorative coatings.

Our supply chain consists of own manufacturing capabilities combined with long-term partnerships to assure maximum quality, minimal lead times and highly competitive prices.

Sputtering Targets

We supply a comprehensive range of sputtering targets used both in R&D and industry.

Beside our core products chromium, titanium, silicon and aluminium we also provide refractory metals like tantalum or niobium. The spectrum is topped off with ceramic materials like SiO_2, Nb_2O_5 and HfO_2. For the complete range, please turn to the end of the "materials" section.

Targets can be delivered in cylindrical shape for rotatable magnetrons as well as in all common plane geometric shapes such as, for example, circles, triangles, rings and racetrack style.

Purity starts with commercial industry standards as low as 99.2 % but can also reach an ultra high grade of 99.9999 %.

Evaporation Materials

robeko evaporation materials are used in many different applications like e-beam and thermal evaporation. Our comprehensive range covers materials for ophthalmic products, precision optics, contact coatings, microelectronics, etc.

Forms of supply include tablets, pellets and granules in various optimized mesh sizes.

Targets & Evaporation Materials

Manufacturing

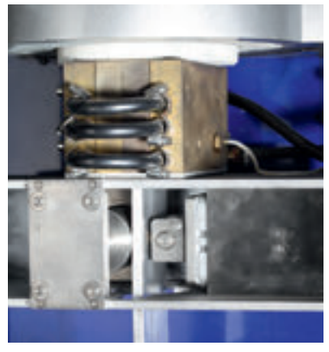
Targets are manufactured by combining in-house capabilities such as continuous casting, milling and cleaning with external resources for HP, HIP, water jet cutting, high volume machining, etc.

Commodities like titanium, chromium, aluminium and copper are stocked in adequate production quantities and machined to order, thus assuring short lead times.

An optimized supply chain, standardized production processes and testing procedures ensure that the premium quality standards can be maintained and the goods can be tracked.

Workshop Equipment

- Milling machine
- Tempering furnace
- Cleaning station
- Continuous cast machine
- Sand blaster



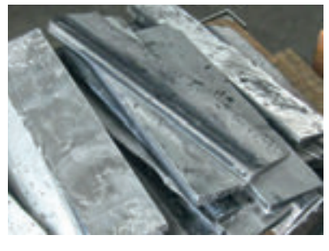
Quality

Our commitment to quality is manifested in industry standards such as fully described production charts, incoming inspections, material certifications, batch and serial numbers. In addition, we characterize and develop materials in our sputtering machines. These processes range from simple power tests to the definition of layer properties. Material can be analyzed in-house by aid of the Fischerscope XDAL.

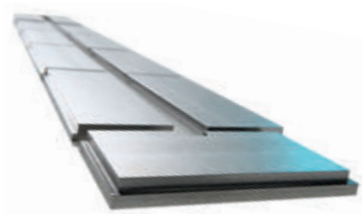
Recycling

Due to the ongoing shortage of raw materials and to increasing costs, recycling of waste sputtering targets becomes more and more interesting. robeko reclaims used targets which are either refined for the production of new targets or delivered to other metal processing companies.

Recycling is most efficient for refractory materials like, for example, Cr, Mo, Ta, Nb as well as for ITO, Sb_2Te_3, Cu and Co.

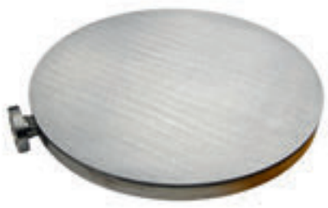


Targets & Evaporation Materials



Pure metals

Material	Purity	Planar target	Cylindrical target	Evaporation material
Al	2N5 – 6N	X	X	X
B	3N	X		X
C	3N – 6N	X		
Cr	2N5 – 3N8	X	X	X
Co	3N	X		X
Cu	4N – 5N	X	X	X
Fe	3N	X		
Gd	3N	X		X
In	3N – 5N	X		X
Ni	2N2 – 4N	X		X
Si	5N – 6 N	X	X	X
Sn	3N – 4N	X	X	X
Ti	Gr 1, Gr 2, 4N	X	X	X
Zn	2N7 – 5N	X	X	



Refractory metals

Material	Purity	Planar target	Cylindrical target	Evaporation material
Mo	3N5 – 3N8	X	X	X
Nb	3N5	X	X	X
Ta	3N5	X	X	X
W	3N5 – 5N	X		X
Zr	Zr702 – 3N5	X	X	X

Precious metals

Material	Purity	Planar target	Cylindrical target	Evaporation material
Ag	3N – 4N	X		X
Au	3N – 4N	X		X
Ir	3N	X		X
Pd	3N	X		X
Pt	3N5	X		X
Ru	3N	X		X

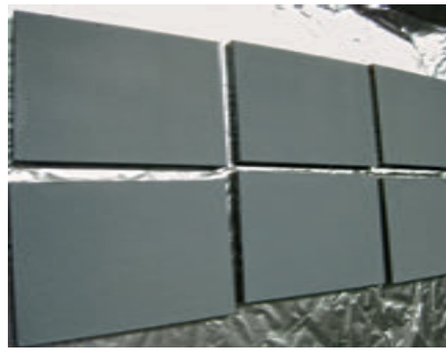
Targets & Evaporation Materials

Alloys

Material	Purity	Planar target	Cylindrical target	Evaporation material
CuGa	4N – 5N	X	X	
CuSn	3N	X	X	
InSn	3N5	X		
NiCr	2N5 – 3N5	X	X	
NiV	3N	X	X	
Sb_2Te_3	3N	X		
SiAl	3N	X	X	
TiAl	3N	X		
WTi	3N – 4N	X		
ZnAl	3N5	X	X	
ZnSn	3N	X	X	

Ceramics

Material	Purity	Planar target	Cylindrical target	Evaporation material
Al_2O_3	3N – 4N	X		X
B_4C	2N5	X		
HfO_2	3N5	X		X
ITO	4N	X		X
MoS_2	2N5	X		
Nb_2O_5	2N5 – 4N	X	X	X
Si_3N_4	2N5	X		
SiO	3N	X		X
SiO_2	4N5	X	X	X
Ta_2O_5	3N5	X		X
TiB_2	3N5	X		
TiOx	3N	X	X	X
$ZnO:Al_2O_3$	4N	X	X	X
ZrO_2	3N	X		X



Targets & Evaporation Materials

Copper

robeko manufactures planar and cylindrical sputtering targets for application in electronics and display production. We provide cylindrical monolithic targets of industrial standard size. Thus we guarantee maximum material density, small grain size and maximum power density combined with good recyclability. The raw material is always on stock.

Target size – PLANAR

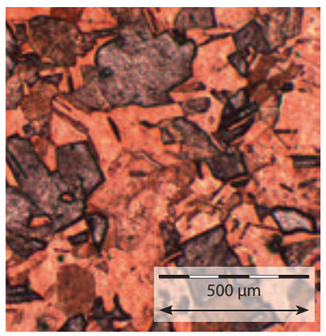
- Thickness up to 25 mm
- Diameter (max) = 400 mm
- Target length (max) = 3000 mm

Target size – ROTATABLE

- Inner diameter = 125 mm
- Outer diameter (max) = 163 mm
- Target length (max) = 2800 mm

Applications

- Touch panels
- TFT LCD
- EMV metallization



Specifications

Density (%)	Purity (%)	Electrical resistance (µΩ·cm)	Thermal conductivity (W/mK)	Grain size
> 99.9 (8.96 g/cm³)	> 99.99 (4N)	1.69	408	180 µm acc. ASTM

Typical analysis

Cu	O	Bi	Pb	Others
> 99.99 %	0.0002 %	0.0001 %	0.0004 %	0.004 %

Targets & Evaporation Materials

Chromium

robeko supplies high quality materials such as hipped chromium targets with purity grades ranging from 99.5 to 99.99 %.

- 100 % density = 7.19 g/cm³
- Dimensional stability
- Enhanced mechanical properties
- Uniform grain size distribution
- Small grain sizes

Target size – PLANAR

- Single piece up to 2000 mm
- Multi-assemblies/bonded to copper backing plate
- Manufactured to customer specifications

Target size – ROTATABLE

- Backing tube diameter = 133 x 4 mm, Cr thickness 10–15 mm
- Manufactured to customer specifications
- Hipped or sprayed

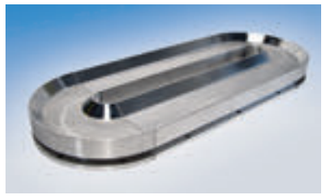
Applications

- Decorative coatings
- Mirrors
- TFT LCD

Typical analysis

Composition Cr > xx.xx %	Impurities, ppm, less than									
	Al	Fe	Mo	Ni	Si	W	C	N	O	S
99.5	20	1000	30	50	200	30	200	100	1500	100
99.9	15	500	20	50	100	30	200	80	800	80
99.95	20	300	15	30	80	20	100	80	300	50

Targets & Evaporation Materials



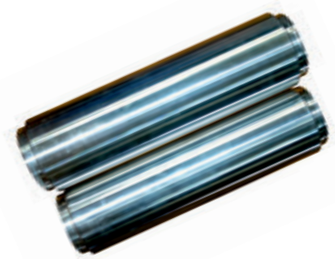
Aluminium

robeko supplies high quality aluminium targets with purity grades ranging from 99.2 to 99.9999 %.

- 100 % density = 2.70 g/cm³
- Uniform grain size distribution
- Enhanced mechanical properties
- Small grain sizes

Target size – PLANAR

- Monolithic target/single piece up to 2.250 mm
- Alternatively multi-assemblies/bonded to backing plate; max dimensions up to 3.800 mm
- Manufactured to customer specifications



Target size – ROTATABLE

- Tube length up to 2.250 mm
- Sprayed targets for length over 2.250 mm
- Al thickness 6–15 mm
- Monolithic target tube with machined customized target end flanges

Applications

- Mirrors, Solar reflectors
- Decorative coatings

Aluminium Alloys

- AlMgSi
- AlSi
- AlSiCu
- AlCu

Specifications			
Shape	**Manufacturing**	**Purities**	**Max size**
Planar	Cast	99.5-99.99 %	Bonded Up to 3.800 mm
Cylindrical	Sprayed	99.5-99.95 %	Up to 3.800 mm
Cylindrical	Monolithic	99.5-99.99 %	Up to 2.250 mm

Targets & Evaporation Materials

Titanium and Titanium Alloys

robeko supplies high quality Ti targets with purity grades ranging from 99.2 (grade 1–2) to 99.99 % and Ti alloys like TiAl36/TiAl50.

- 100 % density = 4.51 g/cm³
- Uniform grain size distribution
- Enhanced mechanical properties
- Small grain sizes

Target size – PLANAR

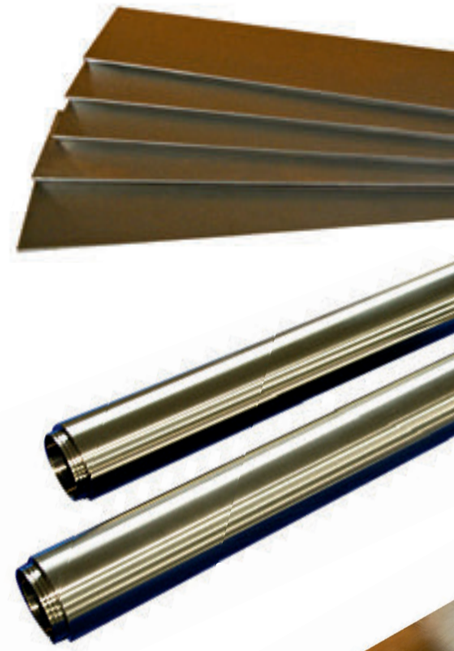
- Single piece up to 3.800 mm
- Alternatively Ti tiles bonded onto backing plate
- Monolithic target
- Manufactured to customer specifications

Target size – ROTATABLE

- Tube length up to 3.800 mm
- Ti thickness 10–15 mm
- Monolithic target tube with customized target end flanges

Applications

- Tribological layers
- Antireflective layers



Nickel Chromium

- Purity 99.5–99.95 %
- Uniform grain size distribution
- Small grain sizes

PLANAR

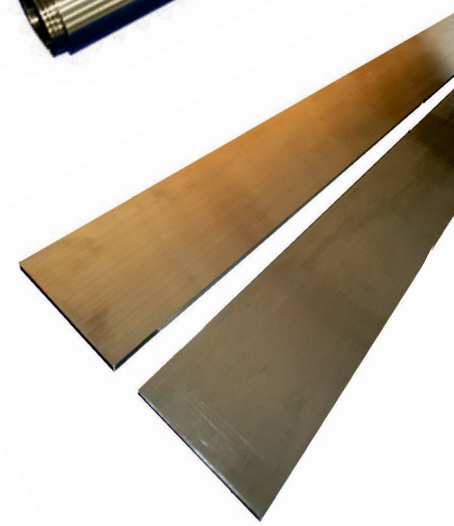
- Single piece up to 3.800 mm
- Monolithic target or bonded onto backing plate

ROTATABLE

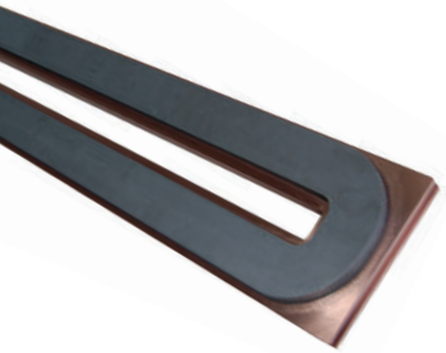
- Single piece up to 3.800 mm

Applications

- Tribological layers
- Buffer layers



Target Bonding



Introduction

Many sputtering targets need to be bonded to a backing plate or a magnetron body. When it comes to high power sputtering with low target cracking and good mechanical stability, the bonding procedure is crucial.

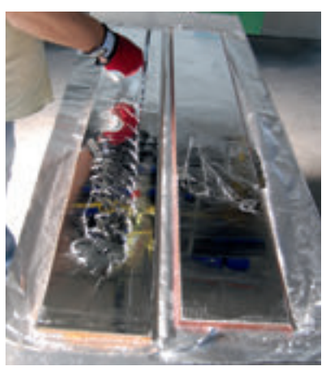
Our engineers and bonding staff can look back on many years of experience in providing joining techniques to correlate with different material combinations and applications. The right choice of adherence coating, diffusion barriers and the adequate bonding method is a prerequisite for obtaining perfect results.

Bonding Technologies

robeko bonding processes ensure the thermal integrity of the interface between the system's cooling assembly and the target surface which suffers most of heat exposure. In cooperation with our customer we select the best joining technique for assembling the target/backing plate from one of the following bonding methods:

- Indium bonding
- Elastomer bonding
- Nanobond
- Epoxy bonding (conductive)

The two main methods are described in the following.



Indium Bonding

Sputtered intermediate layers and Indium or Indium-based solders are used in the prevailing technology. Backing plates and targets are wetted with Indium, placed onto each other and aligned at about 160 °C. After fixation the assembly is allowed to cool down to room temperature.

Target Bonding

Nanobond

Nanobond can be performed at room temperature. Using a reactive foil as a heat source between target and backing plate, this method causes low thermal stress, creates high bonding coverage and allows higher sputtering power densities effected by solders with higher melting points. Nanobond is a superior method of bonding materials with dissimilar expansion coefficients.

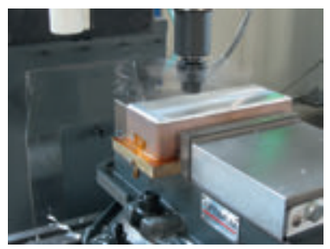
Backing Plates and Tubes

Planar backing plates and cathode bodies are manufactured mainly from high purity copper which boasts the best thermal properties. The backing plates can also be composed of different materials such as titanium, molybdenum and stainless steel if required.

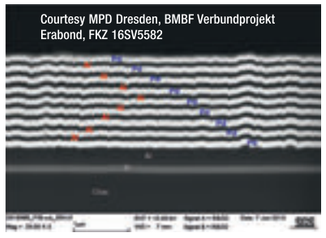
For rotatable magnetrons we supply backing tubes made of stainless steel and titanium. We can provide any length up to 4000 mm. Our backing tubes, 133 x 4 mm in thickness, are manufactured from cold drawn seamless pipes according to the industry standard OD. Other dimensions like 160 mm OD are available at request.

Workshop Equipment

- Sputter system for backside metallization
- Ultrasonic wetting system
- Four bonding tables, maximum length 3800 mm
- Remelting furnace for solder
- Hydraulic press for Nanobond



Application Center



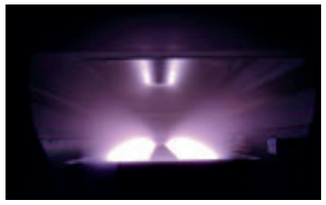
Introduction

Our application center focuses on the evaluation of processes, components and materials. We demonstrate the feasability of customer projects as well as internal production methods.Using the very same equipment foreseen for the real process we are able to validate the usability for the future production.

robeko is your partner for any development from basic performance tests to the creation of new products including low volume pilot production.

These are the principle steps we take:

- Definition of process properties and/or choice of equipment
- Quotation and customer order
- Change of coater set up with existing and/or new equipment
- Internal preperation and set up
- Invitation of customer for demonstration or feasability experiments
- Analysis of the results
- Recommendation uf suitable components
- Technology transfer to customer



Existing own laboraty equipment and the collaboration with the University of Kaiserslautern and the Fraunhofer Society enables us to quickly analyze deposited films and to push in new directions to find individual solutions for the problems of our customers.

robeko sets a high value on long-term development. We were invited to participate in publicly funded programs as an industry partner for the following activities:

- Material development
- Component development
- Process development
- Creation of machine concepts for process industrialization

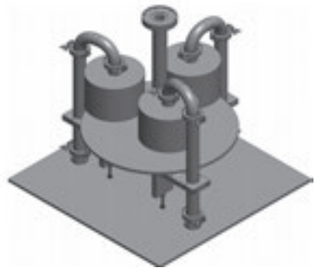
Past Projects

- Scratch resistant coatings (EU – FP7)
- Reactive multilayers for microelectronics (BMBF) (see image on the left)
- Polymer evaporation source (ZIM)
- Metal-polymer multilayer films (ZIM)

Application Center

Erika - Batch Coater

- DC glow discharge plasma treatment
- 3x 6" Magnetrons
- DC, bipolar pulsed and unipolar pulsed power supplies
- Metallic and reactive oxide and nitride coatings

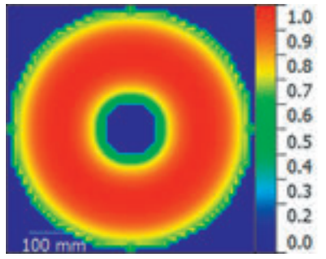


Substrates

- Max. Ø200 mm
- 125 mm ± 5% homogeneity

Existing Coatings

- Metallizing of plastics, ceramics and glasses
  - Solderable coatings
  - Electrical contact
  - Decoration
- Optical coating on glass
  - Anti-reflex coating on sapphire
  - Scratch resistant coating on quartz
- Reactive multilayers
  - Direct soldering of microelectronics



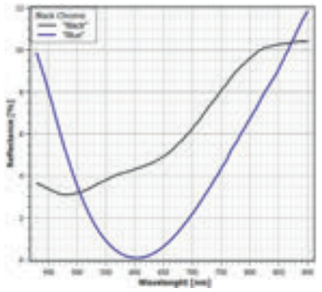
BENEFITS

- No uncoated area due to substrate mounting
- Lowest cost on small substrates and low volume batches

Application Center

Doro — In-Line Coater

- Radiant heater -350° C
- DC glow discharge plasma treatment
- AC glow discharge plasma treatment
- SCI Dual Magnetron Plasma Treatment
- 3x PK 750 Magnetrons
- 2x SCI internal mount TC end blocks for 550 mm length dual rotatable targets
- DC, MF, bipolar pulsed and unipolar pulsed power supplies
- Metallic and reactive oxide and nitride coatings
- In-Situ reflectometry measurement

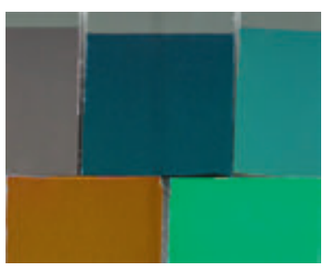


Substrates

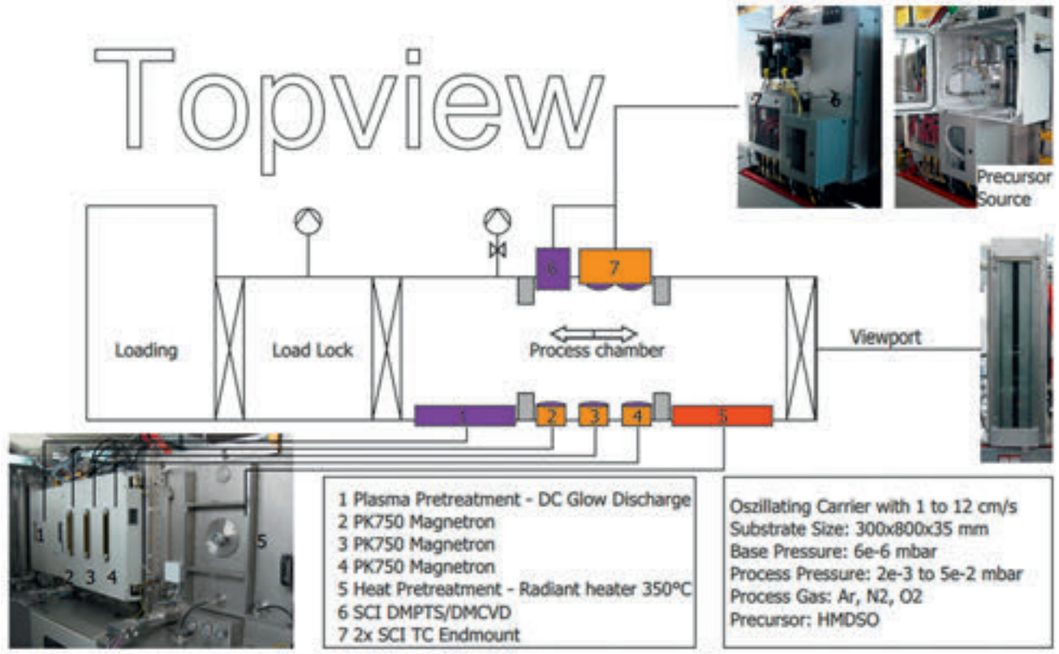
- Max. 640 x 800 x 35 mm
- 300 x 700 mm ± 5% homogeneity

Existing Coatings

- Metallizing of plastics, ceramics and glasses
  - Solderable coatings
  - Electrical contact
  - Decoration
- Optical coatings
  - High rate Al_2O_3
  - High rate SiO_2
- Decorative Coatings
  - Dichromatic Coatings
  - Black Chrome
- Reactive multilayers
  - Direct soldering of microelectronics

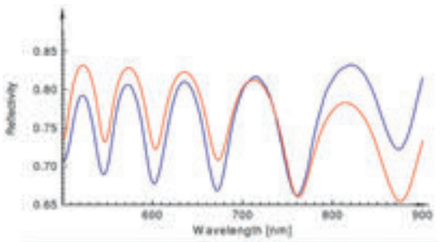


Application Center



BENEFITS

- Precise optical coatings due to online measurement
- Simultaneous coating of both sides possible
- Big substrates
- Production process simulation for coaters with SCI rotary magnetrons



Layer Name	Thickness [nm]
Al2O3 (Sapphire) - sputt	1772.4
Al (Aluminum) - Palik	Substrate

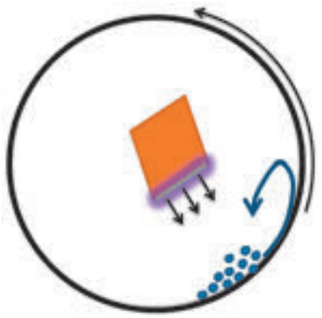
Application Center

Stella -Batch & Bulk Ware Coater

- AC glow discharge plasma treatment
- 2x PK 500 Magnetrons
- DC and unipolar pulsed power supplies
- Metallic and reactive oxide and nitride coatings
- Bulk ware coating in tumble drum

Substrates

- Bulk ware: 2 to 30 mm (spherical equivalent)
- Batch coating: 300 x 300 x 10 mm



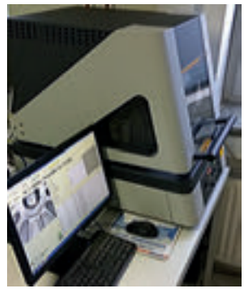
Existing Coatings

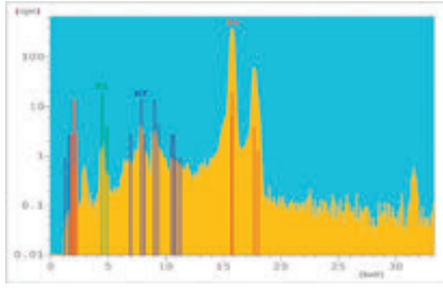
- Metallizing of plastics, ceramics and glasses
  - Catalyst
  - Electrical contact
  - Decoration

BENEFITS

- Coating of small 3D substrates in bulk ware process
- Lowest cost on medium sized substrates and low volume batches
- Lowest cost on small substrates with high volume batches
- Simultaneous coating of both sides possible

Instant Analysis





Introduction

To evaluate the obtained results it is mandatory to have in-house analytical capabilities.

Our equipment comprises basic lab instruments as:

- Jandel RM3-A3 4 Point Probe
- Sauter FH 500 Newton Meter
- Projekt Elektronik FM 210 Teslameter
- Sentech FTPadv Reflectometer
- GE Krautkrämer USM 36 ultrasonic meassuring device

But also more advanced equipment as:

- Fisherscope XDAL
- Bruker Dektak II A
- Sentech SE 801

You will find a more detailed description of the latter on the next pages.

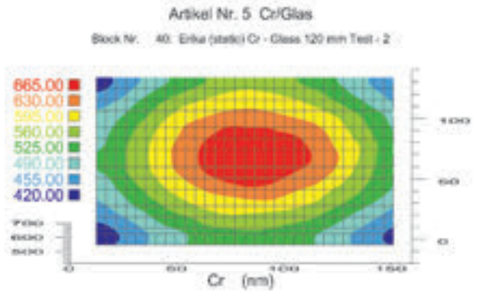
This enables us to perform instant professional analysis of thin film properties. Subsequent adjustments of the process parameters minimize the number of iterations to reach the desired results in the shortest possible time.

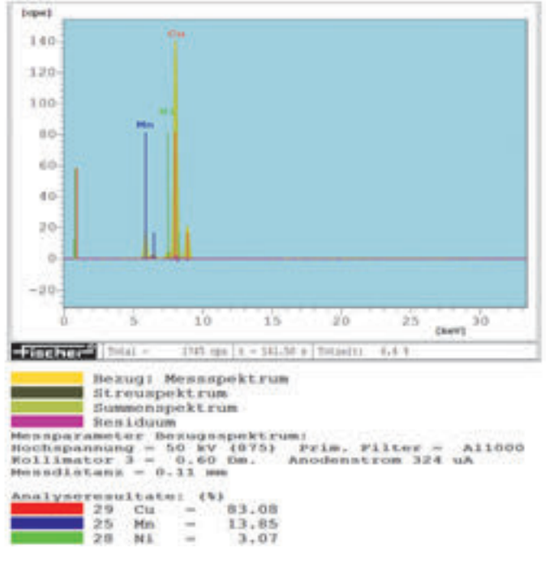
Instant Analysis

Fischerscope XDAL

The Fischerscope XDAL is an x-ray fluorescence (XRF) measurement tool for industrial applications. XRF works by exciting the sample material and detecting the characteristic x-ray emission coming from the sample. The collected data can be used to calculate the material composition or the thickness of a multilayer thin film layer stack of a sample. A motorized XYZ unit allows measurement of profiles or x-y film thickness mappings.

Technical Data	
Detector Lower Limit	P, Atomic Number 15
Limitations Material Analysis	± 50 ppm
Measurement	
Film Thickness	0,05 - 5000 µm (depends on Element)
Limitations Film Thickness Measurement	No repeated elements in the layer stack
Sample Size	Flat: 600 x 600 x 8 mm 3D: 250 x 250 x 200 mm
X-Y Positioning Automatic Measurement Size	150 x 250 mm



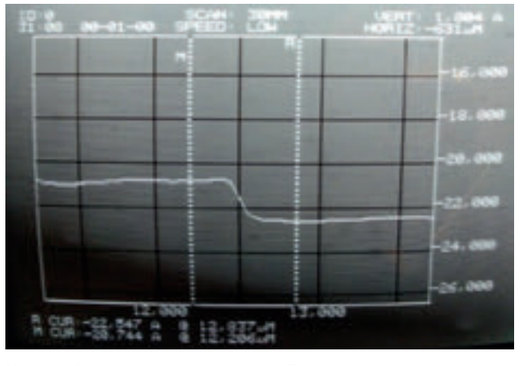


Instant Analysis

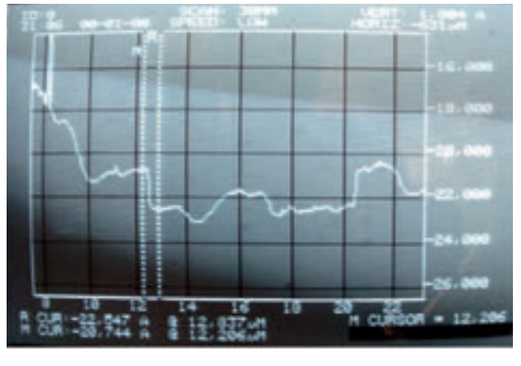
DEKTAK II A

The Bruker Dektak II A is a tactile profilometer for measuring surface roughness or film thickness on prepared samples.
Tactile profilometers measure the force against a small needle and that is moved lateral to the sample. This force is kept constant by changing the position of that needle via a small piezo in Z direction. The piezo movement is logged and gives a height profile of the sample.

Technical Data	
Measurement Range	0 - 50 µm
Profile length	30 mm
Limitations Film Thickness Measurement	Sample needs a Step for every layer thickness that needs measuring
Sample Size	Dia. 150 x 10 mm

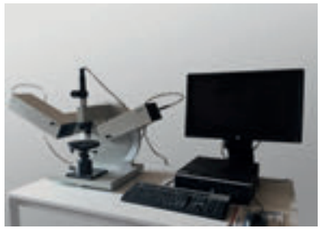


Step of 180 nm Aluminum on float glass – Zoom on Step



Step of 180 nm Aluminum on float glass – Full Scan

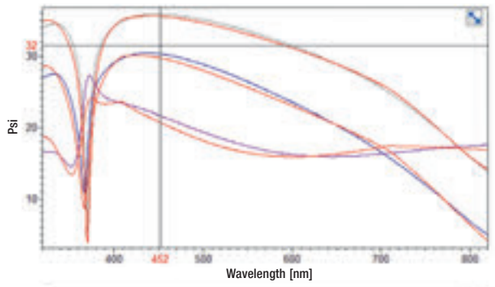
Instant Analysis

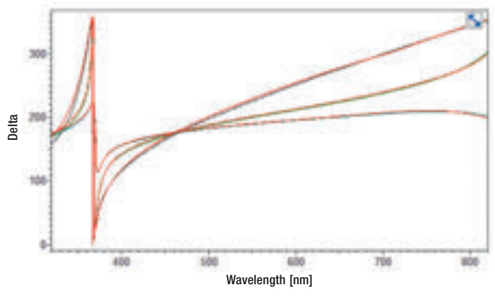


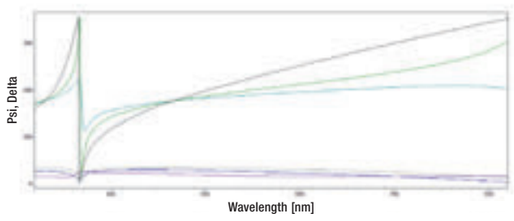
Sentech SE 801

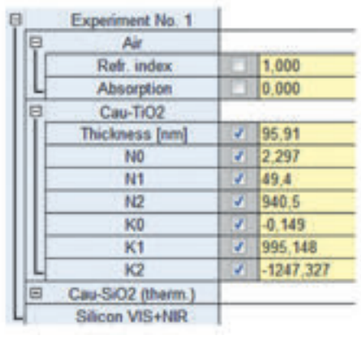
The SE 801 Ellipsometer is a tool for measuring the optical properties (complex refractive index, film thickness) by measuring the change of polarization upon reflection of polarized light and comparing those measurements to a model.

Technical Data	
Spectral Range	370 – 1050 nm
Angle of Incident	40° - 85°, 5° Steps
Film Thickness	10 nm – several µm
Limitations Film Thickness Measurement	Basic Knowledge of all layers Transmission of all Layers >> 0 Reflectance of Substrate >> 0
Sample Size	Dia. 150 x 10 mm









Notes

Certificate

Standard **ISO 9001:2015**

Certificate Registr. No. **01 100 1600475**

Certificate Holder:

robeko GmbH & Co. KG
An der Heide 3 b
67678 Mehlingen
Germany

Scope: Development, manufacturing and sales of components, materials and technologies for physical vapour deposition as well as job coating

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity: The certificate is valid from 2019-08-15 until 2022-08-14.
First certification 2016

2019-05-20

TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln

www.tuv.com

TECHNOLOGY COMPONENTS MATERIALS

10/2019