

# POLARIS™ GEN II

## Product Specification 2 & 3 Inch Round Sputtering Sources

### Target Diameter

2" & 3"

### Target Thickness

**Clamped or bonded (with backing plate):** 0.125" to 0.188" [3,18 to 4,7mm]

**Directly water cooled:** 0.188" to 0.25" [4,7mm to 6,3mm]

The copper backing plate supplied with the source is 0.060" [1,6mm] thick. The total combined thickness of the backing plate and a non-magnetic target should not exceed 0.250" [6,3mm]. Optimal performance (widest pressure range and the most stable process conditions) is achieved when a total combined thickness of 0.188" [4,7mm] is used.

The allowable thickness for magnetic materials varies according to the permeability of the target itself. In general, only very thin targets can be used (0.060"/1,6mm or less).

### Target Mounting

Targets may be bonded, clamped or directly water-cooled depending upon the target material, user preference and power level. Brittle, soft and low thermal conductivity materials should be bonded to the backing plate. This minimizes hot spots, insulating film growth and permits much higher power levels and rates compared to clamped targets. Targets can be clamped to the backing plate only when low power levels are used for short duration. Directly water-cooled targets are recommended for high power, high rate sputtering of mechanically strong materials like refractory metals.

### Magnet Array

A "balanced" magnet module is supplied as standard. Custom arrays for "unbalanced" magnetron sputtering



and for sputtering specific magnetic materials can also be supplied.

### Pressure Range

#### High End

Approximately 1 Torr (efficient magnetron sputtering occurs at pressures of  $3 \times 10^{-2}$  Torr argon pressure or less).

#### Low End

A plasma can be ignited and sputtering sustained at pressures of approximately  $5 \times 10^{-4}$  Torr argon pressure for most materials when using the recommended 0.188" [4,7mm] combined target/backing plate thickness. Stable operation is dependent upon having a pumping system with sufficient gas throughput capacity and mass flow controllers and throttle valves capable of operating in the desired pressure regime.

### Ultimate Pressure

A base pressure of  $5 \times 10^{-9}$  Torr can be achieved in a well constructed and maintained vacuum system with Polaris™ sputter sources installed.

### Argon Gas

High Purity (at least 99.995%). Depending upon the gas throughput capacity of the vacuum system, 2-3 sccm, when injected through the sputter source is sufficient to sustain a plasma discharge. Flow rates of up to 50 sccm can be injected through the cathode. Typical flow rates range between 5-10 sccm. Flow rates that exceed the gas throughput capacity of the system can raise the pressure within the dark space region too high, resulting in arcing and sputtering of the cathode and ground shield.

## Bakeout Temperature

With cooling water flowing: 20 – 180° C

No cooling water flowing: 20 - 50° C

## Cooling Water

**Water Pressure:** 20 – 100 psig

## Flow Rate

0.5 – 1.75gpm. A minimum flow rate of 0.5 gpm should be established to prevent overheating the magnet module.

## Inlet Temperature

Room temperature recommended. The temperature of chilled systems should be regulated so that the dewpoint is never reached.

**Exit Temperature:** 50° C Maximum

**PH Level:** Between 6 – 8

## Electrical Resistance

Greater than or equal to 50 Kohms relative to true earth ground, not signal ground.

## Power Supplies

### DC

Up to 5 kW continuous duty

### 13.56 MHz RF

RF/DC Feedthroughs have been designed for 600 watts continuous duty.

**AC, Pulsed DC and HPPMS/HIPIMS** can also be used without source modification.

## Power Connection

.164-32-UNC (8-32) x .25" Long Socket Head Cap Screw

## Vacuum Connection

Bulkhead KF-40 Flange

## Feedthrough Options

1" Baseplate and ¾" OD polished tube for compression fittings are standard. Custom adaptors, tilt angle and other configurations are offered. Consult factory.

## Cleaning

All parts exposed to vacuum or process gas are precision UHV cleaned or electropolished.

## Trapped Volume

All tapped holes and o-ring grooves are vented.

## Materials of Construction

**Cathode Body:** C11000

**Ground Shield/Anode:** 304 CRES

**Mounting Flange:** 304 CRES

**Argon Gas Fitting:** 316 CRES

**Target Clamping Ring:** 304 CRES

**Target Backing Plate:** C11000

**O-Rings:** Viton

**Insulators:** Ultem

**Threaded Fasteners:** 316 or 18-8 CRES

**Magnet Assembly:** NdFeB encapsulated in dense, durable epoxy adhesive within CA 360 brass enclosure

**Water Fittings:** Push to connect, o-ring sealed, nickel plated brass

**Argon Gas Tubing:** Teflon PFA

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Visit our Web Site: [www.msi-pse.com](http://www.msi-pse.com) for CAD drawing blocks, complete specifications, performance data, ordering information, drawings and dimensions, backing plate and target fabrication data.

# MATERIALS SCIENCE, INC.

## Vacuum & Thin Film Technology