

## **SpinTron 3: 3-inch High Vacuum Magnetron Sputter Source Product Installation and Use**

The 3-inch high vacuum magnetron sputter source can be used to sputter both magnetic and non-magnetic targets, and can be operated with either DC or RF power supply.

It is extremely important that the installation of the sputtering gun be performed by engineers who are experienced in vacuum system/technology. Please follow the safety precautions below.

### **SAFETY PRECAUTIONS:**

- **Before each use, the cathode of the sputtering gun should be carefully checked for electrical insulation from the anode (the exterior) of the gun. Do not use the sputtering gun if you are unsure that the anode and cathode are electrically isolated.**
- **The water flow circuit should be checked to ensure no leakage. Check the integrity of the water tubes for wear and degradation regularly and replace the Teflon tubes if necessary. Use PURE, FILTERED water for cooling, so that the electrical resistivity of the cooling water is VERY HIGH. Use a water-flow interlock to shut off the power supply to the gun if the water flow is impeded or if the water flow rate falls below the specified rate of 1.0 GPM.**
- **Use two 10-foot long Teflon (0.75" OD) tubes as extensions for the water inlet and outlet. Always use insulating connectors to connect the Teflon tubings.**
- **Clamp the Aluminum shaft collar-bore to the stainless-steel tube of the gun TIGHTLY outside of the Quick-Connector. This will prevent the gun from being sucked into the chamber by the large pressure differential.**
- **Never sputter through a sputtering target, as this can damage the surface of the sputtering cathode.**
- **Use a sputtering gas pressure interlock to shut off the power supply to the gun in case of a sudden increase in the sputtering gas pressure.**

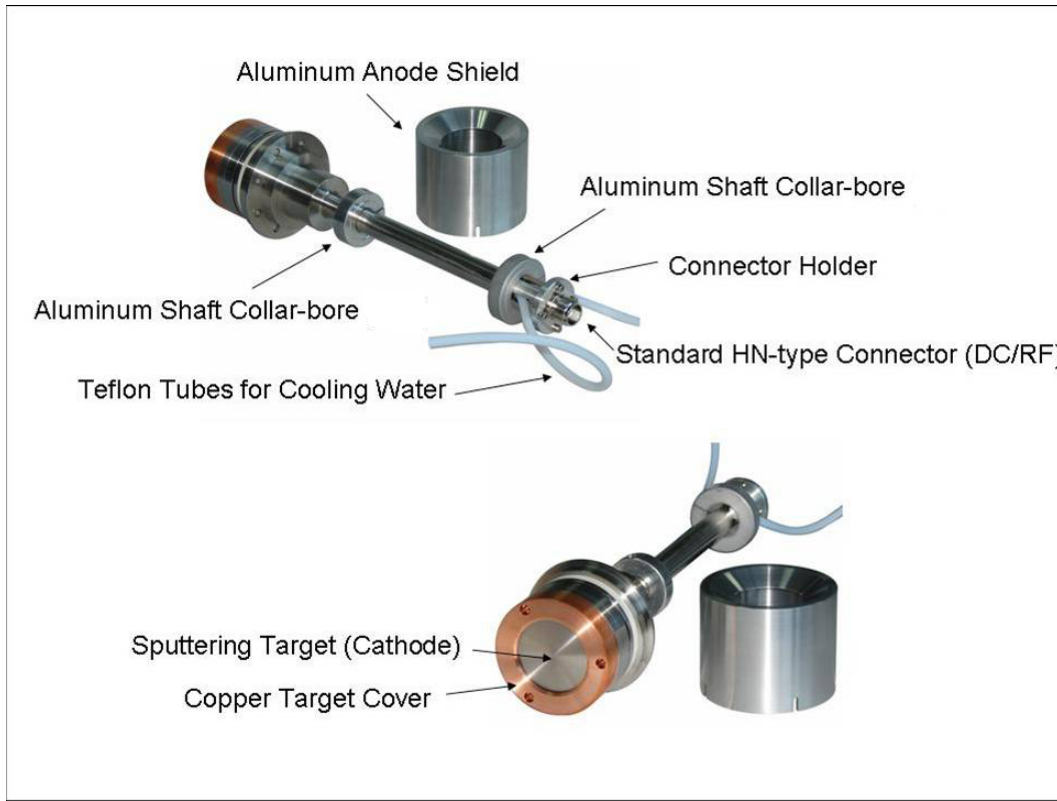
### **Parts List:**

This box should contain the following items:

1. A fully assembled sputtering cathode including: a copper target cover for clamping the sputtering target onto the cathode, and one set of screws used to secure the target cover.
2. An aluminum anode shield.
3. This manual.

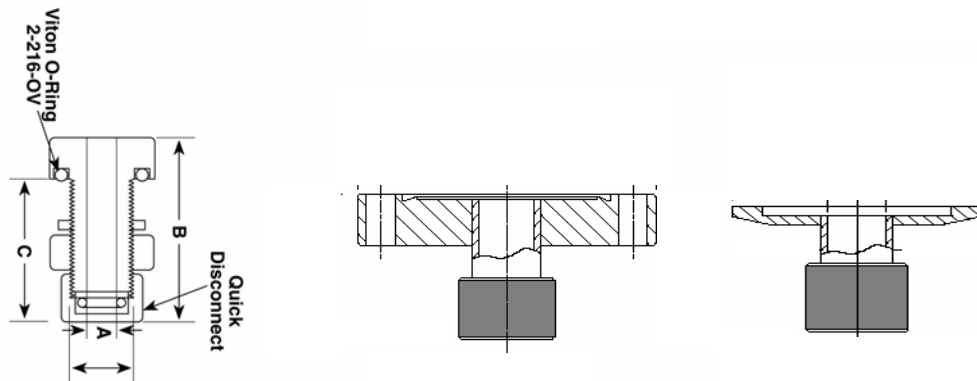
**Operating Specifications:**

<b>PHYSICAL/PROCESS</b>	Min.	Typical	Max.	Unit
Sputtering Power, DC		300	1200	W
Sputtering Power, RF		200	600	W
Operating Pressure	3	4	30	mTorr
Operating Temperature	10		100	°C
<b>TARGET</b>				
Target Diameter		3		inch
Target Thickness (Non-Magnetic)			1/8	inch
Target Thickness (Magnetic)			1/16	inch
Target Utilization			30	%
<b>COOLING WATER</b>				
Flow Rate		1.0	1.0	GPM
Input Temperature		20	20	°C
Pressure, open drain			60	Psig



## **Notes Before Installation:**

1. A Hybrid Adaptor (not included) is needed for the purpose of mounting the 3" sputtering gun into the vacuum chamber. The Quick-Disconnect can be connected to the baseplate of the vacuum chamber, to a CF flange or a KF flange, which are further connected to the chamber through flanged ports. The figure below shows the drawings of the Quick-Disconnect to the baseplate, CF-Flange, and KF Flange. The tube size for the Quick-Disconnect fitting is 1-1/8".
2. Before operating the sputtering gun, provisions must also be made for the supply of cooling water, electrical power (DC or RF), and plasma source gases.



## **Installation Instructions:**

1. Before inserting the gun into the Quick-Disconnect, check the vacuum chamber for potential leakage by using a blankoff plug into the Quick-Disconnect. Make sure that the O-ring inside the Quick-Disconnect is vacuum-greased.
2. If there is no vacuum leakage, remove the electrical connector holder from the bottom of the gun and remove the aluminum shaft collar-bore from the stainless-steel tube of the gun.
3. Insert the gun through the Quick-Disconnect. Adjust the position of gun in the vacuum chamber, and then tighten the Quick-Disconnect nut.
4. (IMPORTANT) TIGHTLY clamp the aluminum shaft collar-bore (1-1/8") to the stainless-steel tube of the gun outside of the Quick-Connector. This ensures that the gun will not be sucked into the chamber by the large pressure differential.
5. Attach the electrical connector holder back to the bottom of the gun. Make sure that the electrical clamp inside the holder is tightly connected to the thick middle copper wire inside the tube. Do not bend the copper wire and make sure the wire is centered. The supplied aluminum shaft collar-bore (1-1/8") is used to clamp the connector holder onto

- the stainless-steel tube of the gun.
6. Check for electrical continuity between the top surface of the gun (cathode) and the central pin of the electrical connector at the bottom. The resistance between these two points should be a few ohms or less.
  7. Check for electrical isolation between the top surface of the gun (cathode) and stainless-steel tube of the gun (anode), by measuring the resistance between these two points. This resistance should be similar to that of an open circuit.
  8. Introduce cooling water to the sputtering gun using Teflon tubes (1/4" ID, 3/4" OD). Allow the water to flow for several minutes and ensure that the water flow is unimpeded and that there is no water leakage inside or outside of the gun.
  9. Inside the chamber, place a 3" sputtering target directly onto the top stainless-steel surface of the gun. Place the copper target cover over the target and secure it with the three provided M3 screws.
  10. Finally, use the aluminum anode shield to cover the top of the gun. Make sure that cathode and the anode are electrically isolated from each other.
  11. Attach the power supply cable to the bottom of the gun through the standard HN-type connector (DC or RF).
  12. The chamber can now be pumped down for testing of the gun.

### **Operation Instructions:**

Once the gun is installed and connected to the water and power supplies, it is ready for operation. Before operation, double check the electrical isolation between the cathode and the anode by measuring the resistance between the inner pin and the outer surface of the HN connector. Then, make sure that a high vacuum level can be achieved with the gun installed. And finally, check the water seal and tubes to make sure there is no water leakage and water flows smoothly.

To protect your process equipment, it is **STRONGLY** recommended that the output of the power supply be interlocked to:

- Flow of cooling water. This will guard against fluctuations in or the cessation of water supply which could destroy your magnet module, insulators and O-rings due to rapid heating of the gun once water flow is impeded.
- The chamber pressure (pressure gauge interlock should be located on the vacuum chamber). This will protect process against pump failure and air/water leaks that develop during operation.

Once the gun has been positively tested for leak-free operation and electrical insulation, and the vacuum chamber is in the high vacuum state, the gun can be operated. To operate the gun, follow these instructions:

1. Establish a proper supply and drain for the cooling water and commence water flow.
2. Begin the regulated flow of process gas and establish a working pressure.
3. Connect and turn on the power to the sputtering gun. Slowly increase the gas pressure until a sputtering gas plasma is observed (it should generate near the top surface of the gun). Once the plasma is steady, the sputtering gas pressure can be adjusted to the desired operating level.
4. After the sputter process is finished, turn off the power supply and then the process gas flow. It is recommended that the cooling water flow be continued for a few minutes to allow the sputtering gun to be cooled to ambient temperature.
5. Turn off the cooling water flow, and flush air or nitrogen gas through the cooling water lines to dry the whole cooling circuit. This practice will help to reduce water-induced corrosion in the cooling circuit.

If you have any questions about this product, please feel free to contact us at [admin@micromagnetics.com](mailto:admin@micromagnetics.com).