

Non-Bonded Cylindrical ITO **Process and Operating Procedure:**

The cylindrical ITO targets are highly susceptible to cracking if exposed to thermal shock or sudden, quick changes in environment – such as venting a chamber immediately after running the cathode. This procedure will describe the safe operating conditions for starting and stopping the non-bonded, cylindrical ITO process.

Bonded ITO targets, on both linear and planar magnetrons, are specified for operation at a power rating of about 4 W/mm of target length.

Example: the users target assembly is 1m or 1000 mm in length. Therefore, the maximum recommended operating power would be 1000mm x 4 W/mm or 4000 Watts.

Non-bonded ITO works on the principle that if the ITO is ramped up or down uniformly in temperature, and allowed to expand freely in a controlled manner then the safe upper limit for power can be at least 2x that of bonded ITO. The following precautions are required:

1. To assure the the ITO does not develop a hot spot on the plasma side and a cold spot on the back side, cathode rotation should be set to maximum or ~ 18 rpm. The rotation and cooling water flow should be started before turning on the power to the cathode or even before starting to heat the chamber
2. The starting process power should be ~ ¼ of the rated power if the target were bonded. Your power supply or PLC control logic should be equipped with a current limit set point which should be just set just slightly higher than the operating current at this power level. This step is just to assure the target surface is cleaned and there will be no heavy arcs due to contamination of the target surface that can damage the ITO cylinders. For our example above the power would be set to 1000 Watts with a current limit of 2 amps.
3. After ~ 5 min., or when it is seen there are no arcs being detected, the power can be raised to ½ of the rated power if the target were bonded and we can begin to ramp up to the final process. For our example above the power would now be raised to 2000W with a current limit increased to 5 amps.
4. The power can now be raised at a steady state rate of 1 W/sec. until the final operating power is reached. Upon reaching this power the ITO process is now ready for production or test.

At the end of the production / test, the following process should be used to cool the ITO target cylinders.

1. Maintain system vacuum, rotation speed and cooling water flow.
2. Ramp the power down to 0 at a rate of 2 W/sec
3. During or prior to ramp, turn off all system heaters in proximity to the ITO targets.
4. When the cooling ramp is at 0, allow 15 minutes of rotation and water flow, under vacuum.
5. Do not “dump” the chamber to atmosphere but rather use standard vacuum procedures for both a soft and rough vent.

FINAL NOTE: To avoid breakage and disruption to production, the ITO target cylinders should be replaced when the wall thickness is ≤ 1 mm.