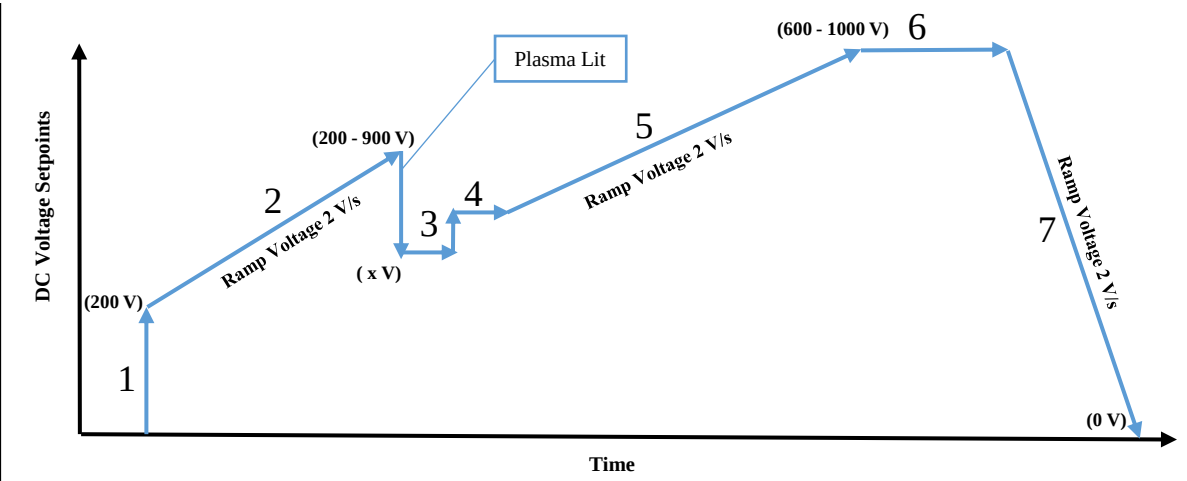
Kurt J. Lesker Company
PROCESS EQUIPMENT DIVISION

HiPIMS Quick Start Guide

*This general guideline may not be suitable for all materials or applications. This is intended as a supplemental guide to the Starfire Impulse Manual (please read the manual before using the quick start guide). If you are having issues operating the HiPIMS unit, please contact the Kurt Lesker Company Technical Support Service.

Revision D
1/26/2023



DC Power Supply

HiPIMS Unit

*If using a dual HiPIMS unit, two DC power supplies are required.

Sputter Cathode

Note: Use < 6-foot coax cable to connect the HiPIMS unit to the sputter cathode. Overall inductance of cable + cathode needs to be less than 1 µH.

1) Initial Setpoints

- Once parameters are set, first enable/start HiPIMS before enabling DC output.

PD500X3 DC Power Supply Limits	
Voltage	200 V
Current	2.2 A
Power	30 W

*PD500X3 DC power supply must be in all regulation mode

Process Chamber Parameters	
Ignition Pressure	15 mTorr
Target Shutter	Open
Substrate Shutter	Closed

HiPIMS Setpoints	
Main Pulse Width	100 µs
Repetition Rate	1000 Hz
Main Pulse Current Limit	20 A
Power	Desired Deposition Power
Kick Pulse	Disabled
Kick Pulse Current Limit	20 A

2) Ramp Voltage to Ignite Plasma

- Ramp up the voltage on the DC supply at 2V/s to a setpoint of 900 V.
- Voltage will increase until plasma has lit.
- The power limit on the DC supply will regulate the power to 30 W.
- Strike voltage can be higher than voltage required to operate at 30 W.
- Dwell for 1 minute at 30 W for stabilization purposes.

3) Reduce Pressure

- Voltage is floating at this point in the process, and as pressure is reduced, the voltage will increase to maintain a power of 30 W.
- Depending on target size, target material, and duty cycle, the minimum pressures vary.
- Magnetic targets require higher deposition pressures. Please add 5 mTorr to the typical minimum pressure chart for the corresponding target size.

Typical Minimum Pressures Based on Target Size	
2 Inch	10 mTorr
3 Inch	5 mTorr
4 Inch	3 mTorr

4) Transfer from Power Control to Voltage Control

- All targets differ in the voltage required to operate a 30 W plasma.
- After dwelling for 1 minute at reduced pressure, change the DC voltage setpoint to the voltage required to operate at 30 W.
  - Use a ramp of 0 to change the voltage setpoint immediately.
- Once the voltage is limited on the DC supply, the power limit on the DC supply can be ramped up to at least 10% greater than the HiPIMS power setpoint.
  - Do not exceed the maximum power density of the target material.
  - For maximum power densities, refer to target information on Kurt Lesker's website.

5) Ramp Voltage and Dial-In HiPIMS Parameters

- Increase the Main Pulse Current Limit on the HiPIMS unit to 200 A.
- Typical voltages to perform a HiPIMS deposition are 600 – 1000 V.
- As voltage is ramped up at 2 V/s on the DC supply, the time average power will increase.
- As the voltage increases, the HiPIMS pulse width can be decreased.
- Suggested ramp-down pulse width at 0.5 µs/s from 100 µs to ~20 µs.
- Once the time average power has exceeded the power setpoint on the HiPIMS unit, the HiPIMS unit will begin to adjust the repetition rate to maintain your power setpoint.
- Use an oscilloscope to view the current waveform. Using the conversion factor found in the HiPIMS manual, determine the peak current. If an increased frequency of overcurrent counts is due to consistently reaching the 200 A current limit, slowly increase the current limit by 1 A/s until the rate of overcurrent events decreases.

Typical HiPIMS Deposition Parameters	
Main Pulse Width (µs)	10 – 50
Repetition Rate (Hz)	250 – 1000
Main Current Limit (A)	200 – 350
Main Voltage (V)	600 – 1000

6) Deposit a Film With HiPIMS

- Kick pulse can be enabled at this time.
- Open substrate shutter and deposit film.
- Use an oscilloscope to view the waveform.

*If overcurrent events occur after enabling the Kick Pulse, increase the Kick delay.

Typical Kick Pulse Parameters	
Voltage (V)	25 – 100
Pulse Width (µs)	10 – 150
Kick Delay (µs)	4 - 20

7) Ramp Down to Power Off

- Once the substrate shutter closes, ramp down the DC supply voltage at 2 V/s.
- Keep the target shutter open.
- Once power has reached < 30 W, the DC supply output can be disabled.
- Once the DC supply output is disabled, the HiPIMS can be disabled.