

IMPULSE™ 2-2 PULSED POWER MODULE

High Power Impulse Magnetron Sputtering



OVERVIEW

The Starfire Industries IMPULSE™ is a versatile pulsed power module that converts a conventional DC sputtering system into a fully-functional High-Power Impulse Magnetron Sputtering (HiPIMS) system. The 2kHz-2kW IMPULSE™ is an affordable thin-film coating solution that is ideal for small 1" to 4" cylindrical and linear cathodes. High-performance dense, high-hardness, non-porous films and superior optical coatings for university, industrial and governmental R&D applications are within reach. The **CE marked design** is available with **standard afterglow** or **positive kick option** in either a single or dual module configuration in a 2U rack. The IMPULSE™ is ideal for reactive sputtering and synchronized co-sputtering or substrate timed pulse bias on dielectric and metal sputtering targets.



FLEXIBLE, SCALABLE PULSE TOPOLOGY

The IMPULSE™ architecture allows combinations for sequential and parallel pulse firings to achieve the optimal operating environment for your application. Easily sputtered metals, like copper and aluminum, can draw high peak currents at lower repetition rate. More difficult metals or dielectrics can be effectively managed at high-repetition rate with lower peak currents. Higher frequency, higher power configurations are available; i.e.

BIAS & SYNCHRONIZATION

The IMPULSE™ 2-2 is offered with an optional **user-adjustable positive kick pulse** that engages after the termination of the main negative pulse to enhance ion transport to the substrate, increase deposition rate and tailor film stress, as well as clearing charge on surfaces for reactive applications—broadening the process envelope. In addition, the IMPULSE™ 2-2 retains the synchronization and substrate bias timing capability to selectively choose which ions will implant in the film densification phase. This allows users to tailor the substrate bias energy for metal or dielectric ion implantation while minimizing carrier gas ion effects. Multiple IMPULSE™ modules can be synchronized without any additional hardware for cluster tool operation.

- ⇒ Pulsed power add-on module for your existing DC power supply
- ⇒ Flexible pulse topology allows high-frequency, lower-current (**2kHz, 200A**) or low-frequency, higher-current (**1kHz, 400A**)
- ⇒ Optional positive kick for higher ion fraction % & deposition rate
- ⇒ Good for reactive applications
- ⇒ Remote operation capability



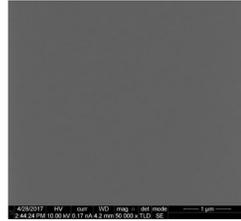
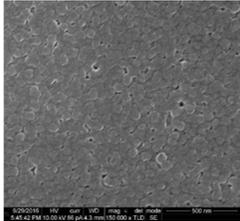
IMPULSE™ 2-2 Dual Pulsed Power Module

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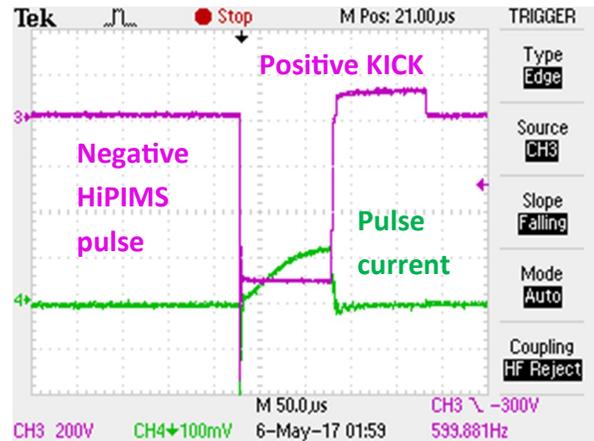


APPLICATIONS

- ⇒ Dense, Hard Films
 - ⇒ Non-Porous Films
 - ⇒ Superior Optical Coatings
 - ⇒ Superconductors
 - ⇒ Multilayer Films
- For Linear & Cylindrical Cathodes*



Carbon deposition comparison of conventional DC sputtering (left) with the smooth, hard, non-porous film with high sp^3 provided by HiPIMS (right)



IMPULSE™ 2-2 I-V Waveform

PHYSICAL AND PERFORMANCE SPECIFICATIONS

PARAMETER	BASE MODEL	ADVANCED KICK MODEL
	SF-IMPULSE2GX-SH (single) SF-IMPULSE2GX-DH (dual)	SF-IMPULSE2KX-SH (single) SF-IMPULSE2KX-DH (dual)
Input Power Specifications	1 Phase, 100-240 VAC, 50/60 Hz, 2.5 A per module	
Input Charging Supply	-1000 VDC nominal, -1250 VDC tolerant	
Time-Average Power	~2 kW; subject to duty factor and rep rate	
Output Peak Voltage	-1000 V nominal, -1250 V tolerant	
Output Peak Current	200 A nominal, 400 A tolerant	
Arc Detection Time	< 200 ns	
Arc Arrest Time	< 500 ns	
Over Current Response Time	< 2 μs	
Peak Current Limiter	User adjustable up to 400 A in high current operation, 200 A in high frequency operation	
Power Limit Mode	User selectable up to 2kW	
Pulse Frequency	User selectable; 1kHz to 2kHz (high current mode) or 1Hz to 4kHz (high frequency mode) nominal range, subject to power derating curve	
Pulse Width	User selectable; 2 μs to 1000 μs nominal range	
Quench Pulse Set Points	On/Off; User selectable in 1 μs increments for pulse width	N/A
Kick Pulse Set Points	N/A	On/Off; User selectable in 1 μs increments for pulse width
External Communications	RJ-45 control I/O, USB Type A, BNC sync line, BNC I-V monitor out	
Pulse Module Sync	< 0.1 μs latency	
Cathode Cabling	N-type HV connector standard	
Configuration Storage	Onboard storage for 20 user selectable presets	
Physical Dimensions	2U rack; 19" (W) x 3.5" (H) x 22.5" (L) including handles and plugins 482.6mm (W) x 88.9mm (H) x 571.5mm (L) including handles and plugins	
Weight	Single module: 26 lbs, 1.8 oz. (11.84 kg) Dual Module: 30 lbs, 3.0 oz (13.69 kg)	Single module: 26 lbs, 14.8 oz. (12.21kg) Dual Module: 31 lbs, 13.0 oz (14.43 kg)
Operating Temperature	+5C to +40C, forced air cooling	

