



- Nanocomposite
- Monolayer
- Nanolayer
- Superlattice
- Multilayer

- TiCN
- ZrN
- TiAlN
- AlCrN
- TiAlCN
- AlTiN
- TiN
- CrN
- DLC

TRIBO SERIES

Multi Source
Tribological Solutions



TRIBO SERIES PLATFORM

This highly configurable product group enables a wide range of tribological process configurations and simplicity for upgrade or retrofit for future applications. The base system incorporates all of the industrial design features that has made Mustang Vacuum Systems successful across a number of industries.

- Recipe driven industrial control platform with touch screen industrial PC interface.
- Proven industrial system design for ergonomic maintenance and high uptime
- High uptime solution utilizing tier 1 component suppliers with global support
- Single or dual door design with integrated tooling to maximize production capacity

CHAMBER OPTIONS

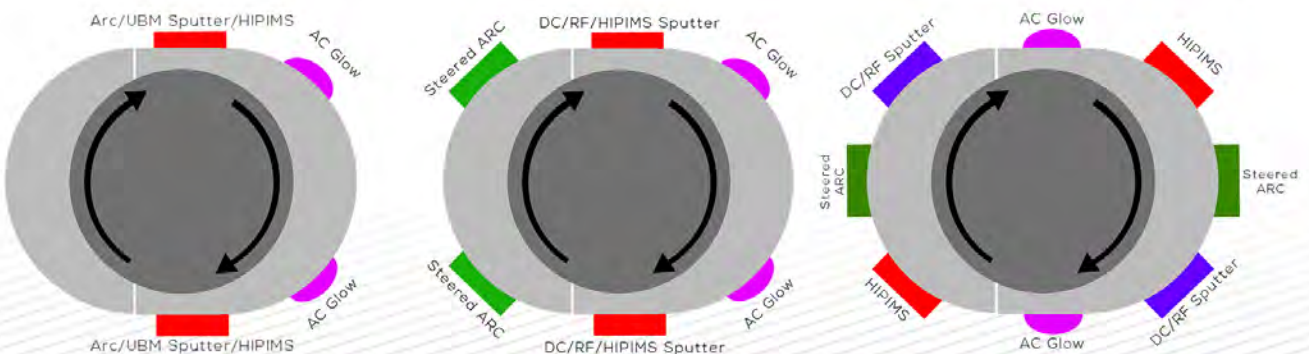
Mustang's highly configurable solutions start with a chamber selection based on the number of sources. Up to 8 deposition positions can be configured with a range of deposition sources and power configurations.

Mustang's systems can be configured to comprise either dedicated single deposition techniques or alternatively by combining deposition methodologies hybrid solutions with up to 8 different deposition methodologies.

Standard coating area of 24inch or 48inch height by 24-38inch diameter with single rotation or multiple planetary rotation.

Some examples of TRIBO Series system configurations are shown below.

4 Source	6 Source	8 Source
Single Process	Dual Process	Advanced Hybrid



- Further customized machine sizes and configurations are also available on request. -



MUSTANG CATHODES

Mustang's patented high power planar cathodes have the highest, large format, power densities available.

- 200 Watt inch² or 30 Watt cm² maximum allow for the most demanding high energy/high rate process.
- Sealed water body design and complete customer serviceability increases uptime and reliability.
- Patented high temperature clamping system eliminates target warping.
- Designed for high uptime, the cathodes are easily removed and configured with quick release water and power connection and integrated material handling for single person maintenance.



SOURCE CONFIGURATIONS

Mustang offers integration of sources from a number of leading suppliers in addition to offering its own deposition sources. Sources are configured with a wide range of power options with a highly robust and repeatable recipe based interface.

Sputtering - Planar and rotating configuration.

- High rate unbalanced magnetron sputtering (DC, Pulsed, AC, RF)
- High rate conventional / balanced sputtering (DC, Pulsed, AC, RF)
- HIPIMS

PACVD/PECVD - Plasma assisted/enhanced chemical vapor deposition

- Hot filament excitation, RF & mid-Frequency [40kHz, 250kHz] bias
- DC / AC linear glow discharge

Evaporation

- Steered cathodic arc (rectangular & circular cathode arrangements)
- Random cathodic arc
- Thermal
- Electron beam

Hybrid Systems - Combine two or more deposition methodologies in a single chamber with advanced recipe control so materials can be deposited sequentially or simultaneously.

- PVD + PACVD
- UBM + Arc/HIPIMS

Single source or hybrid configurations with up to eight deposition sources, controlled with MVS proven recipe driven interface, providing the widest flexibility for power sources and deposition methodologies. Mustangs Industrial Power Switching Network allows for multiple power sources to be software selected with no physical hardware changes allowing customers to switch from AC, DC, RF or HIPIMS rapidly and safely with a push of a button.



SERVICE & SUPPORT

Mustang Vacuum Systems and our global service partners provide onsite installation, repair service, preventative maintenance, applications and service training. TRIBO Series systems come standard with a dedicated VPN or analog telephone connection, allowing Mustang's service and support team to remotely diagnose and resolve any problems. We are available to provide support for your system 24/7.

COMMON APPLICATION AREAS

- | | |
|---------------------------------|-------------------------------------|
| Cutting & Forming Tools | Military/Armaments |
| Decorative/Color | Oil & Gas |
| Automotive Components | Transportation |
| Aerospace Components | Energy & Energy Storage |
| Medical & Dental Tools/Implants | General Engineering & Machinery |
| General Wear Resistance | Sporting/Leisure Goods |
| Oxidation Resistance | Jewelry, Watches, Pens, Eye Glasses |

DEPOSITION LAYERS

	Color	Hardness [HV]	Thickness [µm]	Max Temp [°C]	Friction Coefficient vs 100Cr6]	Most Common Equipment Configuration
TiN	Gold	2400-3000	1-4	500	0.5	2-4-6 Cathode Steered Arc or UBM Sputter
TiCN	Blue/Grey	2400-3200	1-3	400	0.3	
ZrN	Champagne	2000-2700	1-4	500	0.5	
ZrCN	Various	2000-3000	1-3	400	0.35	
CrN	Silver	1700-2800	1-5	700	0.5	
TiAlN	Dark Grey/Purple	2300-3000	1-4	800	0.55	
TiAlCN	Grey/Black	2500-3200	1-3	700	0.4	
AlTiN	Blue/Black	2400-3100	1-4	850	0.55	
AlCrN	Grey	2600-3200	1-4	950	0.5	
Ti-DLC	Grey-Black	700-1500	1-5	250	0.15	4 Cathode UBM Sputter
Cr+WC/C	Grey-Black	800-1800	1-4	250	0.15	
Graphite/Low H	Grey	500-2000	1-3	250	0.1	
CVD a-C:H	Grey-Black	1000-3000	1-3	280	0.05	Dual Cathode UBM Sputter with Hot Filament
CVD Doped a-C:H	Grey-Black	1000-3000	1-3	280-350	0.05	