



## Ion Pumps for High Energy Physics

# TITANIUM SUBLIMATION PUMPING (TSP)

Titanium Sublimation Pumps (TSPs) are often used in combination with ion pumps or independently to remove reactive gases from the vacuum environment. Combined with an ion pump, the TSP allows for low ultimate pressures in a shorter amount of time. All TSP components are bakeable to 400 °C.



## TSP FILAMENT CARTRIDGE

The filament cartridge is mounted on a 2- 3/4 in. CFF (NW 35). The feedthrough supports three titanium-molybdenum filaments and a return path for ground isolation. Each filament contains 1.5 grams of usable titanium and averages 20 hours of operation.

## LIQUID CRYOSHROUD

The liquid cryoshroud consists of a double walled, type 304L stainless steel cylinder with two liquid nitrogen feedthroughs (.375 in. diameter) with flare type fittings. It provides 1,578 cm<sup>2</sup> (245 in.<sup>2</sup>) of liquid nitrogen cooled surface area that provides pumping speeds up to 12,000 l/s for hydrogen (see table). The shroud is mounted on an 8 in. CFF (NW 150) or a 10 in. CFF (NW 200).

## AMBIENT SPUTTER SHIELD

The ambient sputter shield economically maximizes surface area when cooling is not practical or possible. It provides 827cm<sup>2</sup> (128 in.<sup>2</sup>) of ambient temperature surface area that provides pumping speeds up to 2,200 l/s for hydrogen (see table). The shield is mounted on an 8 in. CFF (DN 150) or a 6 in. CFF (NW 100).

## DIGITEL TSPq CONTROLLER

The TSPq controller has an easy-to-read color touchscreen display that displays all manual or programmed firing parameters. Manual operation is as simple as pressing one button. Programming is just as easy by viewing all programming options on one screen. The TSPq controller can operate up to 8 TSP filaments.



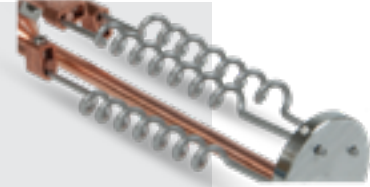
## Ease of use

The TSPq and MPCq controllers are each fully controlled with an intuitive color touchscreen.



## Filaments

Each titanium-molybdenum filament contains 1.5 grams of usable titanium and averages 20 hours of operation.



## Connectivity

TSP cables have MS style connectors that are bakeable and radiation resistant.



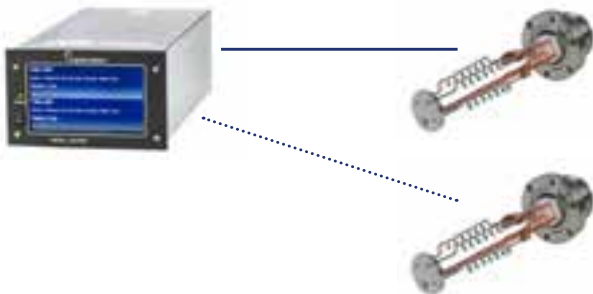
## Safety

High currents travel over distances up to 15 meters through bakeable and radiation-resistant insulated and strain relief cabling.



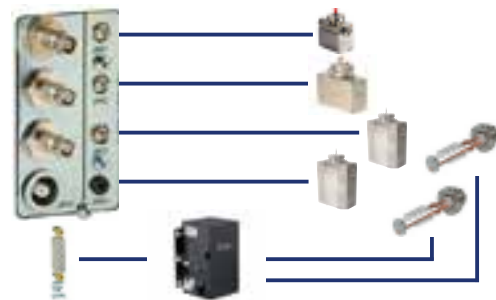
# DIGITEL FLEXIBILITY

The DIGITEL line is flexible enough to control a wide variety of ion pump and TSP configurations. The MPCq can operate up to four ion pumps simultaneously or independent operation of one or two ion pumps. The MPCq is capable of controlling one or two TSP pumps independently from the remote TSP controller or internal TSP (ITSP).



## EXAMPLE CONFIGURATION 1

Single or dual TSP operation from the TSPq Controller



## EXAMPLE CONFIGURATION 2

Three parallel diode ion pumps, one triode ion pump, and dual TSP operation from the MPCq.

# TSPq CONTROLLER SPECIFICATIONS

Specifications		Digital TSPq	Remote rTSP
<b>Input power</b>	voltage	100-120 or 200-240 VAC	100-120 or 200-240 VAC
	Frequency	47-63 Hz	47-63 HWz
<b>Output power</b>	independent Outputs	1	1
	Current (maximum)	55A	55A
	Watts (maximum)	800 (max)	800 (max)
	Resolution	0.1A	0.1A
<b>High current connections</b>		1-2 MS type*, Configurable	1-2 MS type*, Configurable
<b>Display</b>	Type	7" TFT WVGA 800 x 480 Color LCD, Touchscreen	None
	Readouts	Current, on-time, and programmable options	Current, on-time, and programmable options via MPCq
<b>Analog outputs</b>	Voltage	Linear configurable	Linear configurable
	Current/Pressure	Linear or logarithmic, configurable	Linear or logarithmic, configurable
<b>Control modes</b>		Manual, programmed, or remote	Manual, programmed, or remote
		Ethernet	Ethernet via MPCq
		Serial: RS-232, RS-485 2 wire, RS-485 4 wire	Serial: RS-232, RS-422 2 wire, RS-485 4 wire via MPCq
		Profibus (optional, coming soon)	
<b>Conformity to norms</b>		EN 55011 Class A, IEC 801-2	EN 55011 Class A, IEC 801-2
		EN 801-3, IEC 801-4, EN 61010-1	EN 801-3, IEC 801-4, EN 61010-1
<b>Weight, kg (lbs)</b>		16 (36)	13.1 (29)
<b>Size</b>		3U high. 1/2 rack wide	293 x 219 x 130 mm (min)
		462 x 208 x 130 mm (L x W x H)	(12 x 9 x 5 in)
			293 x 219 x 150 mm (max)
			(12 x 9 x 6 in)
<b>Additional features</b>		TSP interlock	TSP interlock via MPCq

\*Amphenol MIL-DTL-5015 P/N 97-3102A-24-22S(946)

## TYPICAL TSP PUMPING SPEEDS

	Area (cm <sup>2</sup> /in. <sup>2</sup> )	Temperature (°C)	Rate (L/S/CM <sup>2</sup> )	Speed (L/S)	Rate (L/S/CM <sup>2</sup> )	Speed (L/S)	Rate (L/S/CM <sup>2</sup> )	Speed (L/S)
<b>Liquid cryoshroud (8 in.)</b>	709/110	20° C	2.6	1,843	8.2	5,814	7.3	5,176
	1,578/245*	-195° C	17	12,053	11	7,799	14.6	23,039
<b>Ambient sputter shield (8 in.)</b>	827/128	20° C	2.6	2,150	8.2	6,780	7.3	6,037
<b>Ambient sputter shield (6 in.)</b>	621/96	20° C	2.6	1,614	8.2	5,092	7.3	4,533

\*Amphenol MIL-DTL-5015 P/N 97-3102A-24-22S(946)



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