

Titanium sublimation pump with Cryopanel & Titanium element

- High Pumping Speed at low pressures $\leq 10^{-10}$ mbar
- Alloy Wire: 85% Titanium, 15% Moly
- Bakeable until 350°C

Titanium Sublimation Pumps

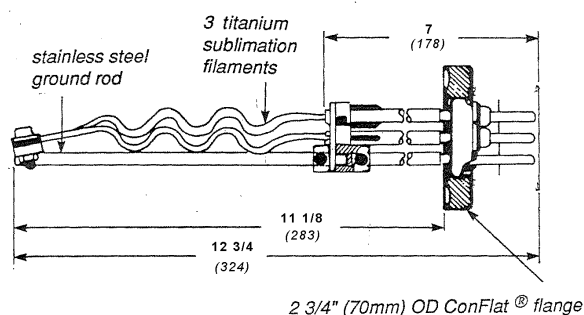
Titanium Sublimation Pumps operate by heating a filament containing titanium to a temperature where the metal “sublimates” from the filament to the nearby walls of the vacuum system. (Sublimation goes directly from the solid phase to the vapor phase without going through the intermediate liquid phase.) Anyway, the titanium film on the vacuum system walls combines with the active gases as the gas molecules strike the wall.



This provides a clean, high speed, simple auxiliary type of pump for many high vacuum applications. The more rapidly the gas molecules strike the wall (the higher the pressure) the more rapidly the titanium film gets saturated. Active gasses include hydrogen, nitrogen, oxygen, carbon monoxide, carbon dioxide and water vapor. TSP's are generally used below 10^{-4} mbar. At this pressure, the filament would be operated continuously since it rapidly saturates. The lifetime of a continuously operating TSP filament is 10-20 hours; there are 3-4 filaments per cartridge, depending on the brand. At lower pressures, the operation can go to intermittent sublimation, since the fresh titanium film saturates more slowly. Some control units can be set to cycle automatically. If one could use all the titanium and dispense it with 100% efficiency, filament lifetime would be:

- 10^{-5} mbar range days
- 10^{-6} mbar range weeks
- 10^{-7} mbar range months
- 10^{-8} mbar range years

Of course, everything depends, on factors such as system temperature (low is better), system gas access/conductance (high is better), gas species (noble gasses such as argon and helium require another pumping mechanism; methane also requires some other pump), system area/geometry, etc..



Varian style TSP cartridge with 6 mm pins for Europe

Gas Temp	H ₂	N ₂	O ₂	CO	CO ₂	H ₂ O	CH ₄	Inerts
+ 20°C	3	4	2	9	8	3	0	0
-196°C	10	20	6	11	9	14	0	0

Typical Pumping Speed for various gases on sublimed titanium surface [$\text{ls}^{-1}\text{cm}^{-2}$]

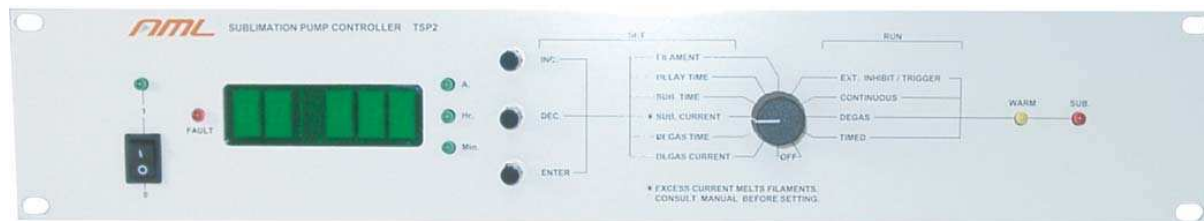
Liquid Nitrogen Shroud



High-speed LN2 cooled cryoshroud. Full-flood design keeps all surfaces at LN2 temperature. Readily removeable for maintenance purposes. All stainless steel construction.

Titanium Sublimation Controller

The TSP2 titanium sublimation pump power supply will control most pump cartridges with up to 4 filaments. It regulates the quantity of material sublimated from the filaments, compensating for changing conditions and eliminating the need for operator attendance or adjustment.



Features

Sublimation pump controller

- Sublimation current settable over the range 30 to 55A in increments of 0.1A
- Self-timed delay between getter renewal adjustable from 1 minute to 9.9 hours
- Suitable for a wide range of cartridges with up to 4 filaments, 85% Ti, 15% Mo filaments from 1.8 to 2.1mm diameter
- Sublimation inhibit / trigger function by external switch or relay
- Filaments are warmed and cooled gently to avoid thermal shocks. The sublimation current contains minimal harmonics to reduce the risk of early filament failure due to magnetostrictive stress or mechanical resonance
- Pump current is accurately regulated in order to automatically compensate for mains variations and pump cable warming
- Filaments may be run for degassing at currents between 5 and 25A to prevent overloading the ion pump. Filaments can be kept warm at the end of a system bake
- Indicates open-circuit filament, shorted cable / filament, inhibit and overtemperature
- Thermal overload protection
- No in-service adjustment is required
- 2U (88mm) high full-width, steel cased instrument for easy rack-mounting

Specification:

- **Temperature:** 10 to 40°C for rated performance. Operation up to 50°C is possible at longer sublimation intervals, i.e. below 10⁻⁶ mbar.
- **Supply Voltage:** 220 / 240V (Option H) OR 100 / 110V (Option L), 50Hz or 60Hz, to order
- **Power Consumption:** Less than 20 watts when idling, less than 700 watts when sublimating at 55A with a maximum-length cable.
- **Output Current:** Regulated at 30 to 55A RMS x 0.1A in sublimation, 5 to 25A RMS x 5A in degass.
- **Output Voltage:** The output voltage is determined by the cable and cartridge resistance. Maximum output voltage is 9.5V RMS at 45A
- **Timing:** Sublimation period 0.1 to 3 minutes x 0.1 min.. Delay interval 1 to 59 minutes, 1 to 9.9 hours. Degas time 1 to 99 minutes. All timing is derived from mains supply frequency.
- **Output Duty Cycle:** 100% at 300W output power and less than 30°C ambient temperature.
- **Dimensions:** 2U high (88mm), full width (483mm) x 366mm deep.
- Weight: 11 kg

Ordering No.

Titanium Sublimation Pumps

Description	Dimensions in inch.				Model No.	Price
	A	B	C	D		
TSP Balzers Type on a CF40 flange w/ 6 mm pins, w/o MS Connector; 3 filaments	11.0	1.73	2.75		TSP-275-003/6	
TSP Varian-Style on a CF40 flange w/ 5.72 mm pins; 3 filaments	11.0	1.73	2.75		TSP-275-003	
TSP PE Style on a CF50 flange w/ 6.35 pins; 4 filaments	9.5	2.26	3.38	1.62	SB-1000	
TSP PE Style on a CF40 flange w/ 6.35 pins; 4 filaments	9.5	3.07	2.75	1.31	SB-1020	

Titanium Sublimation Pumps Accessories

Description	Model No.	Price
Filaments for Varian/Balzers Style TSP Cartridge, Package of 12 *	TSP-12-VA	
Filaments for PE Style TSP Cartridge, Package of 12 *	SB-1001	
Liquid Nitrogen Shroud (CF 50 mounting flange)	SS400/338	
Liquid Nitrogen Shroud (CF 35 mounting flange)	SS400/275	

Titanium Sublimation Pump Controller

Description	Model No.	Price
Ti. Sublimation pump power supply. 220/240V	TSP2-H	
Ti. Sublimation pump power supply. 100/110V	TSP2-L	
6 meter non-bakeable pump lead	TSP2L6	
6 metre pump lead with 1 meter 200°C bakeable section	TSP2BL6	