GAMMA UHV PUMPS AND ACCESSORIES

Capture pumping technologies create high vacuum (HV) and ultra-high vacuum (UHV) environments for a variety of applications, ranging from portable mass spectrometers to large scale particle accelerators. They can create the highest possible vacuum at an economical cost.

Edwards offers a range of Ion Pumps, Titanium Sublimation Pumps, Non-Evaporable Getter Pumps and accessories exclusively through Gamma Vacuum.

PRODUCT FEATURES

MECHANICAL VIBRATION ELIMINATED

Capture pumps have no moving parts. Vibration from moving parts and electrical noise is eliminated.

HIGH RADIATION TOLERANCE

Capture pumps are built with radiation tolerant materials in excess of 10^8 Gray. Connectors and cables are also built with radiation tolerant materials for years of continuous operation.

HIGH TEMPERATURE TOLERANCE

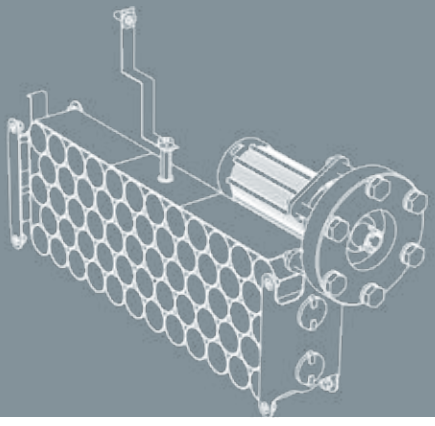
Without any special consideration, capture pumps can be baked to 250 °C. Removing the magnets allows for hotter bakes up to 450 °C. Long hot bakes are critical to every UHV system.

REGULAR MAINTENANCE ELIMINATED

Capture pumps require virtually no maintenance and avoid costly vacuum events because they are sealed from atmosphere, saving time, money and resources.

LOW INITIAL AND OPERATIONAL COSTS

Initial cost is typically less than comparable specifications of other types of vacuum pumps. They use minimal or no power for years of low cost operation.



Technical data: Smaller Pumps

	Units	Mini	3S	5S	10S	25S	45S	75S
Pumping speed	l/s	0.2	2 - 3	4 - 5	8 - 10	15 - 20	30 - 40	40 - 75
Port option								
Copper tube			CU					
DN16 (1.33") [1]		1V	1V, 1H or 1D					
DN40 (2.75") [2]				2V	2H	2V, 2H or 2D		2V or 2D
DN63 (4.5") [3]						4V or 4D		
DN100 (6") [4]								6S or 62
Element choice								
TiTan CV (Diode)			●	●	●	●	●	●
TiTan DI (Noble Diode)		●	●	●	●	●	●	●
TiTan CVX (Diode XHV)						●	●	●
TiTan DIX (Noble Diode XHV)						●	●	●
TiTan TR (Triode)						●	●	●
Feedthrough choice								
MN Mini		●						
5K 5kV SHV			●	●				
SC 10kV SAFECONN				●	●	●	●	●
OP Perkin Elmer						●	●	●
OV Old Varian			●		●	●	●	●
VR Varian StarCell®						●	●	●
FI Fisher Interlock					●	●	●	●
Other data								
Internal heater option					●	●	●	●
Internal TSP/NEG option [5]						●	●	●
Weight	kg (lbs)	0.35 (0.8)	0.45 (1.0)	2.3 (5)	6 (13)	9 (20)	16 (34)	22 (48)
Shipping weight	kg (lbs)	3.5 (7.7)	0.9 (2.0)	2.8 (6)	8 (17)	11 (24)	18 (39)	25 (55)
Ultimate pressure	mbar	$<1 \times 10^{-11}$						
Starting pressure	mbar	$<1 \times 10^{-3}$						
Lifetime (hrs at 1 x 10^{-6} mbar)	hours	Diode/Noble Diode 50,000; Triode 80,000						
Operating bake temperature	°C	100	95	200	250			
Maximum bake temperature [6]	°C	100	450					
Dimensions (L x W x D)	mm	38 x 38 x 51	138 x 41 x 50	106 x 85 x 81	200 x 153 x 79	202 x 125 x 130	209 x 251 x 130	277 x 242 x 130

1 - 1V = 1" perpendicular to feedthrough; 1H = 1" inline with feedthrough; 1D = 1" double ports (perpendicular and inline)
2 - 2V = 2" top port; 2H = 2" side port; 2D = 2" double ports (top and side)
3 - 4V = 4" top port; 4D = 4" top port and 2" side port
4 - 6S = single 6" port; 62 = 6" top port and 2" side port
5 - Extra side or bottom port required
6 - Magnets removed

Ordering information

Ion pumps and integrated TSP/NEG:

Ion pump

Mini	0.2l/s
3S	3l/s
5S	5l/s
10S	10l/s
25S	20l/s
45S	40l/s
75S	75l/s

Element

CV	Conventional diode
DI	Noble diode
CX	Diode XHV
DX	Noble diode XHV
TR	Triode

Flange

1V	Perpendicular DN16
1H	Inline DN16
1D	Double DN16
2V	Vertical DN40
2H	Horizontal DN40
2D	Double DN40
4V	Vertical DN63
4D	DN63/DN40
6S	Single DN100
62	DN100/DN40

Feedthrough

MN	Mini
5K	5kV SHV
SC	10kV SAFECONN
OP	Perkin Elmer
OV	Old Varian
VR	Varian StarCell®
FI	Fisher Interlock

Heater

N	None
1	110V
2	208-240V

Integrated TSP/NEG

N	None
TSP	TSP single filament
N0	50l/s NEG (25/45/75)
N1	100l/s NEG (25/45/75)
N2	200l/s NEG (45/75)
N3	300l/s NEG (75)

Technical data: Larger Pumps

	Units	100L	200L	300L	400L	400LX	600L	600LX	800LX	1200LX
Pumping speed	l/s	80 - 100	160 - 200	240 - 300	320 - 400	320 - 400	480 - 600	480 - 600	640 - 800	960 - 1200
Port option										
DN100 (6") [1]		6S or 6D								
DN160 (8") [2]		8S or 8D				8S, 8D or 8P	8S or 8D	8S, 8D or 8P	8S or 8D	
DN200 (10") [3]							10S or 10D	10S, 10D or 10P	10S or 10D	
Element choice										
TiTan CV (Diode)		●	●	●	●	●	●	●	●	●
TiTan DI (Noble Diode)		●	●	●	●	●	●	●	●	●
TiTan CVX (Diode XHV)		●	●	●	●	●	●	●	●	●
TiTan DIX (Noble Diode XHV)		●	●	●	●	●	●	●	●	●
TiTan TR (Triode)		●	●	●	●	●	●	●	●	●
Feedthrough choice										
SC 10kV SAFECONN		●	●	●	●	●	●	●	●	●
OP Perkin Elmer		●	●	●	●	●	●	●	●	●
OV Old Varian		●	●	●	●	●	●	●	●	●
*VR Varian StarCell®		●	●	●	●	●	●	●	●	●
FI Fisher Interlock		●	●	●	●	●	●	●	●	●
Other data										
Internal heater option		●	●	●	●	●	●	●	●	●
Internal TSP/NEG option [4]		●	●	●	●	●	●	●	●	●
Weight	kg (lbs)	29 (65)	50 (112)	66 (145)	67 (148)	95 (210)	103 (226)	122 (270)	127 (280)	206 (452)
Shipping weight	kg (lbs)	47 (105)	69 (152)	89 (195)	85 (188)	113 (250)	127 (280)	141 (310)	145 (320)	254 (560)
Ultimate pressure	mbar	$<1 \times 10^{-11}$								
Starting pressure	mbar	$<1 \times 10^{-3}$								
Lifetime (hrs at 1×10^{-6} mbar)	hours	Diode/Noble Diode 50,000; Triode 80,000								
Operating bake temperature	°C	250								
Maximum bake temperature [5]	°C	450								
Dimensions (L x W x D)	mm	326 x 128 x 252	325 x 413 x 233	325 x 413 x 337	325 x 413 x 413	537 x 413 x 233	325 x 513 x 513	537 x 413 x 336	537 x 413 x 413	650 x 513 x 513

1 - 6S = single 6" port; 6D = double 6" ports (top and bottom)
2 - 8S = single 8" port; 8D = double 8" ports (top and bottom); 8P = double 8" ports (top and side)
3 - 10S = single 10" port; 10D = double 10" ports (top and bottom); 10P = double 10" ports (top and side)
4 - Extra side or bottom port required
5 - Magnets removed

Ordering information

Ion pumps and integrated TSP/NEG:

Ion pump

100L	100l/s
200L	200l/s
300L	300l/s
400L	400l/s
400LX	400l/s
600L	600l/s
600LX	600l/s
800LX	800l/s
1200LX	1200l/s

Element

CV	Conventional diode
DI	Noble diode
CX	Diode XHV
DX	Noble diode XHV
TR	Triode

Flange

6S	Single DN100
6D	2x DN100 (top/bottom)
8S	Single DN160
8D	2x DN160 (top/bottom)
8P	2x DN160 (top/side)
10S	Single DN200
10D	2x DN200 (top/bottom)
10P	2x DN200 (top/side)

Feedthrough

SC	10kV SAFECONN
OP	Perkin Elmer
OV	Old Varian
VR	Varian StarCell®
FI	Fisher Interlock

Heater

N	None
1	110V
2	208-240V

Integrated TSP/NEG

N	None
TC	TSP & Cryoshroud (not 100L)
TA	TSP & Ambient Shield
NG	400l/s NEG

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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.

TSPs operate by heating a titanium filament and subliming (converting from solid to gas phase) titanium molecules onto a surface. Sublimed titanium molecules are then available to chemically react with reactive gases, like oxygen and nitrogen, and disassociate and diffuse hydrogen. TSPs can operate from 10^{-5} to 10^{-12} mbar and have pumping speeds in excess of 10,000 ls^{-1} for hydrogen.

PRODUCT FEATURES

TSP FILAMENT CARTRIDGE

The filament cartridge is mounted on a 2- 3/4" CFF (DN40). 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 1578 cm^2 (245 in^2) of liquid nitrogen cooled surface area that provides pumping speeds up to 12,000 ls^{-1} for hydrogen (see table). The shroud is mounted on an 8 in. CFF (DN160).

AMBIENT SPUTTER SHIELD

The ambient sputter shield economically maximizes surface area when cooling is not practical or possible. It provides 827cm^2 (128 in^2) of ambient temperature surface area that provides pumping speeds up to 2200 ls^{-1} for hydrogen (see table). The shield is mounted on an 8 in. CFF (DN160) or a 6 in. CFF (DN100).

Technical data

			H_2		CO		H_2O	
	Area	Temperature	Rate	Speed	Rate	Speed	Rate	Speed
Typical TSP pumping speeds	cm^2/$inch^2$	°C	ls^{-1} / cm^2	ls^{-1}	ls^{-1} / cm^2	ls^{-1}	ls^{-1} / cm^2	ls^{-1}
Liquid cryoshroud (8")	709/110	20	2.6	1843	8.2	5814	7.3	5176
	1578/245 (1)	-195	17	12053	11	7799	14.6	23039
Ambient sputter shield (8")	827/128	20	2.6	2150	8.2	6780	7.3	6037
Ambient sputter shield (6")	621/96	20	2.6	1614	8.2	5092	7.3	4533

(1) applies to H_2O speed only

Ordering information

Product description	Order number	Product description	Order number
TSP cartridge 3 filaments 2-3/4" CFF	G360819	1.5 metre cable with MS connectors	MSHC1MS
TSP ambient sputter shield 6" CFF	G360190	3 metre cable with MS connectors	MSHC3MS
TSP ambient sputter shield 8" CFF	G360044	6 metre cable with MS connectors	MSHC6MS
TSP liquid cryoshroud 8" CFF	G360051	10 metre cable with MS connectors	MSHC10MS

NON-EVAPORABLE GETTER PUMPS (NEG)

NEGs are reactive metals that have been pressed onto solid substrates or sintered into discs. The amount of material used controls the speed and capacity of the NEG pump, but typically ranges from 50 to 3,500 ls^{-1} of hydrogen. As NEGs become saturated with gases, they can be reactivated without venting to atmosphere. Their prime advantage is their ability to pump for extended periods without the need for power.

NEGs are ideal for pump down, stay down applications and can be used to boost the performance of an ion pump or as a standalone pump. They are ideal for UHV applications due to their compact size and high H_2 pumping speed. They are not suitable for applications that cycle up to atmospheric pressure regularly as this will saturate the surface and they can only be reactivated a finite number of times.

N50

N100

N200

N300

N400

Technical data

	Units	N50	N100	N200	N300	N400
Flange		DN40 (2.75") CFF				
Total mass	kg (lbs)	0.48 (1.05)	0.54 (1.19)	0.75 (1.65)	0.8 (1.79)	0.85 (1.88)
Alloy composition		Zr (70%),V (24.6%), Fe (5.4%)				
Getter mass	g	31.5	58	108	144	180
Getter surface	cm^2	187	348	642	856	1070
H_2 pumping speed	ls^{-1}	55	106	208	312	412
CO pumping speed	ls^{-1}	27	51	94	125	156
H_2 sorption capacity	Torr l	630	1170	2160	2880	3600
CO (25 °C) sorption capacity	Torr l	0.1	0.2	0.4	0.6	0.8
CO total sorption capacity	Torr l	284	526	972	1296	1620
Insertion length	mm	46	61	89	110	130
Diameter	mm	34				

Ordering information

Product description	Order number	Product description	Order number
50 ls^{-1} NEG cartridge pump 2-3/4" CFF	GN50	400 ls^{-1} NEG cartridge pump 2-3/4" CFF	GN400
100 ls^{-1} NEG cartridge pump 2-3/4" CFF	GN100	1 metre cable with XLR connectors	XLRS1N100
200 ls^{-1} NEG cartridge pump 2-3/4" CFF	GN200	3 metre cable with XLR connectors	XLRS3N100
300 ls^{-1} NEG cartridge pump 2-3/4" CFF	GN300	6 metre cable with XLR connectors	XLRS6N100

DIGITEL™ GAMMA PUMP CONTROLLERS

The DIGITEL™ family of ion pump controllers offers the right balance of performance, power and protection.

Digitel™ SPCe small pump controller

The SPCe is a versatile way to fully operate a single ion pump. An LCD pressure/current/voltage display along with standard serial communications makes the SPCe able to accommodate the needs of basic and advanced users.

Digitel™ QPC quad pump controller

The new QPC controller offers adjustable output voltage, nano ampere resolution plus up to four independent power supplies, allowing for high current control of up to four ion pumps independently. It has an easy-to-read colour touchscreen LCD display that simultaneously displays pressure, current, and voltage and includes serial and ethernet communications as standard.

Digitel™ TSPq and NEGq controller

The TSPq/NEGq controller has an easy-to-read touchscreen LCD 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/NEGq controller can operate up to 8 TSP filaments or 2 NEG pumps.

Technical data

	Units	SPCe	QPC	TSPq	NEGq
Input power					
Voltage		90-240 V a.c. or 24 V d.c.		90-130 or 200-240 V	
Frequency	Hz	48-62			
Output power					
Independent outputs		1	1 to 4	1	1
Open circuit voltage		3000-7000 V d.c. (+/- configurable)		17 V a.c.	35 V a.c.
Current (maximum)	mA	50	125	55000	8000
Watts (maximum)	W	50	125	800	220
Resolution		1 nA	1 nA	0.1 A	-
High voltage connections		1 10 kV SHV or Fischer	1-4 10 kV SHV or Fischer	1-2 MS style, configurable	1-2 XLR
Display type		LCD	1/4 VGA colour touchscreen LCD	1/4 VGA touchscreen LCD	1/4 VGA touchscreen LCD
Readouts		Pressure, current, voltage and programmable options		Current, on-time and programmable options	
Analog outputs					
Voltage		Linear, configurable			
Current/pressure		Linear or logarithmic, configurable			
Setpoints		One relay, one TTL	Four relay, four TTL		
Communications		Local/Remote/Full			
		Ethernet			
		Serial: 232, 422, 485			
Weight	kg (lbs)	1.5 (3.3)	9.5 (21)	16.8 (37)	
Size		2U high, 1/4 rack wide	3U high, 1/2 rack wide		
		313 mm (12.3”) deep	438 mm (17.2”) deep		
Additional features		SAFECONN	SAFECONN	Manual, programmed or remote control	
		AUTOSTART/AUTORUN	AUTOSTART/AUTORUN	TSP enable	NEG enable
		High voltage enable	High voltage enable		
		Fowler-Nordheim calibration			
		High-pot capability			

ION PUMP CABLES

SAFECONN™ High voltage interlock

The integrated SAFECONN™ high voltage interlock system was introduced by Gamma Vacuum to create a safe environment when working with the high voltage cables of an ion pump.

Materials carry up to 10kV of DC current at temperatures up to 250° C. Radiation tolerance is balanced with material flexibility to provide a 90° turning radius while maintaining exposures up to 2 x 10^5 Gray.

The silicone cable carries high voltage and an isolated 5-volt signal for the safety circuit. When properly connected, the 5-volt circuit is satisfied and only then can the DIGITEL™ controllers enable high voltage by the end user or through remote commands.

Once high voltage is enabled, the controller automatically disables high voltage when the cable is disconnected from the ion pump or controller.

The system is electrically isolated to eliminate noise potential that could interfere with other electrical equipment on the same vacuum system.

The SAFECONN safety connection guarantees ground, high voltage, and then safety interlock connectivity when connecting to prevent accidental arcing.

The SAFECONN system guarantees the safety of the operator and equipment from the hazards of working with high voltage by eliminating electrical shocks and false positive vacuum

Standard SAFECONN Connector Options

Controller Connector Options
Compatible with Gamma Vacuum or
Agilent/Varian Interlock System

Pump End Options
Compatible with current or legacy
Gamma Vacuum or
Aglient/Varian Feedthroughs
(non- SAFECONN connectors available)

Technical data

Material (reference)	Radiation (Gray, tolerance)	Temperature (°C, max)
Copper (1, 3, 4)	>10^8	250
Brass/nickel (8)	>10^8	327
Beryllium/copper/gold (8)	>10^8	643
Spring steel/nickel (8)	>10^8	1427
PEEK (8)	5 x 10^7	325
Fiberglass braid (6)	2 x 10^7	250
Silicone rubber (2, 5, 7, 8)	2 x 10^5	250

Specification

Description	Unit	Value
Bend Radius	mm (in)	12.7 (0.5)
Diameter, nominal	mm (in)	8.0 (0.3)
Minimum removal clearance	mm (in)	127 (5.0)

Ordering information

Controllers:

Type
SPC Small Pump Controller
QPC Quad Pump Controller
TSP TSP Controller
NEG NEG Controller

HV polarity
P Positive (CV/DI)
N Negative (TR)

Connections/Channels
1 One Output (ALL)
2 Two Outputs (QPC/TSP/NEG)
3 Three Outputs (QPC)
4 Four Outputs (QPC)
0 Remote Connection (TSP/NEG)

Communications
E Ethernet (SPCe/TSP/NEG)
S Serial (SPCe)
S Serial/Ethernet (QPC)
2 RS232 (TSP/NEG)
4 RS422 (TSP/NEG)
H RS485 Half (TSP/NEG)
F RS485 Full (TSP/NEG)

TSP/NEG control
NA Not Available (SPCe)
NI Not Installed (QPC)
N None (TSP/NEG)
ST Remote TSP Control (TSP)
DT Dual Remote TSP Control (TSP)
SN Remote NEG Control (NEG)
DN Dual Remote NEG Control (NEG)

	Not needed for TSP /NEG	Not needed for TSP /NEG	Not needed for TSP /NEG					

HV channels
1 One HV Channel (SPCe/QPC)
2 Two HV Channels (QPC)
3 Three HV Channels (QPC)
4 Four HV Channels (QPC)

Connector style
S 10kV SHV
F Fischer

Input voltage
U1 110V, USA (ALL)
U2 220V, USA (ALL)
E2 230V, Europe (ALL)
K2 240V, UK (ALL)
A2 230V, Australia (ALL)
B Bare 24V wire (SPCe/QPC)

Remote enable
S Standard (SPCe/QPC)
N None (TSP/NEG)
H High Voltage Enable (TSP/NEG)

Ion pump cables:

Controller connector
SCP SAFECONN (Silicone)
FB Fischer Interlock (Silicone)
10K 10kV SHV (PTFE)
N None (ALL)

Cable type
SC Silicon
TF PTFE

Cable len
3 3 m
6 6 m
10 10 m
30 30 m
50 50 m
75 75 m
100 100 m

Pump connector
SC SAFECONN (Silicone)
FI Fischer Interlock (Silicone)
SCO Original SAFECONN (Silicone)
OV Original Varian (Silicone)
VR Varian Starcell (Silicone)
5K 5kV SHV (Silicone)
10K 10kV SHV (ALL)
VM90 Mini FT Connector (Silicone)
OP Perkin Elmer (PTFE)
N None (ALL)