# Suggested shopping list to implement CTD on a Bruker amaZon ion trap:

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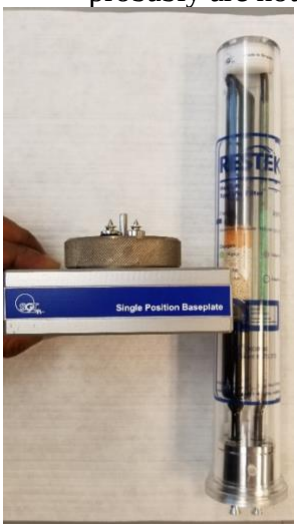
We have tried to be as comprehensive as possible, and we've tried to provide the important specifications for each product. If you have any questions about possible replacements for each supply, we'll do our best to advise you.
**Total estimate cost**: **<$15K** (after purchasing the Bruker amaZon). Estimate include all the power supplies, cables, leak valve, oscilloscope and delay generator etc.

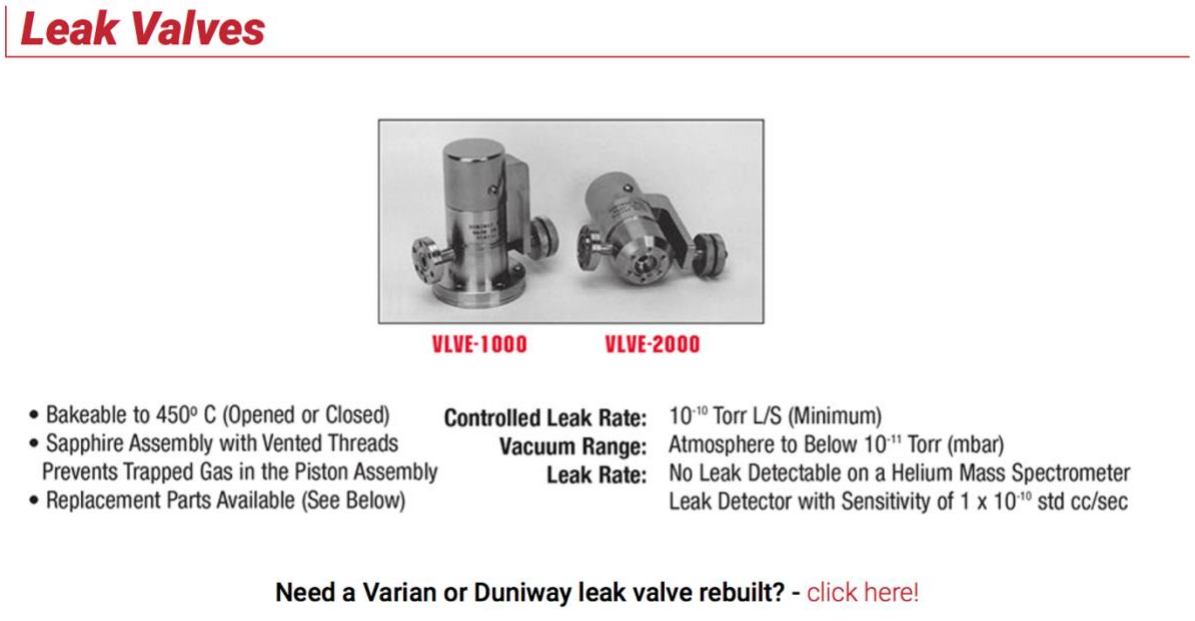
- UHP Helium (we use >99.995% purity) cylinder with stainless steel regulator and required tubing to connect from the regulator through the filters to the variable leak valve (we use 1/8" ss tubing with Swagelock connectors ~$200).

Optional: Extra in-line gas purification system. We use a Restek triple filter (cat #: 22019) with a Restek single position baseplate. ($450)

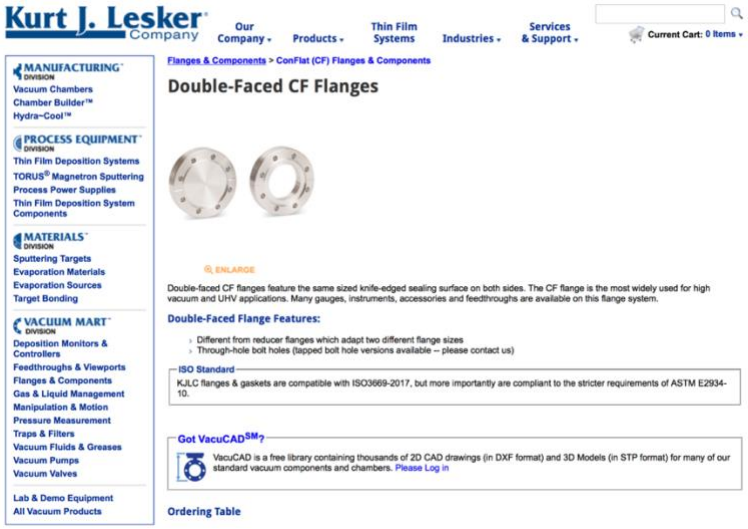
Note added on 2021: Our manuscript in *IJMS* in 2021 shows that the nature and purity of the reagent gas is not important. (Z.J. Sasiene, P.M. Mendis, G.P. Jackson, Quantitative assessment of six different reagent gases for charge transfer dissociation (CTD) of biological ions, Int. J. Mass Spectrom. 462 (2021) 116532. https://doi.org/10.1016/j.ijms.2021.116532) Therefore, the purifier and UHP-grade gas probably are not necessary)



- Duniway Stockroom Corp. Bakeable Variable Leak Valve, VLVE -2000 (https://www.duniway.com/catalog/valves/leak-valves) ($1,200). Any other variable leak valve will be fine for controlling the He flow, as long as it's rate for the low mL/min range.




- 2.75" Conflat spacer ¾" or 1" thick with a >70 mm bore for Ion gun. E.g. model # DFF275X150SS ($78) at https://www.lesker.com/newweb/flanges/flanges_cf_doublefaced.cfm?pgid=0



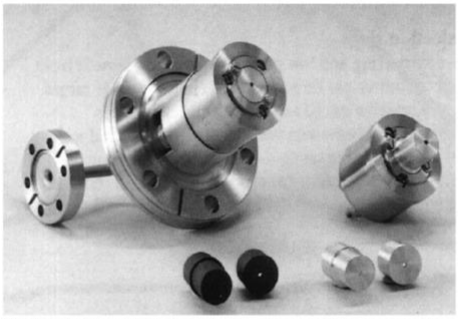
| Flange Size/OD | Drawing | Bore | Flange Thickness | Weight lbs | PartNo | Price | Add Item | VacuCAD℠ |
|---|---|---|---|---|---|---|---|---|
| DN200CF (10.00" OD) | | Blank | 0.97 | 20 | DFF1000X000 | $320.00 | | (please log in) |
| DN200CF (10.00" OD) | | 8.02 | 0.97 | 7.5 | DFF1000X800 | $320.00 | | (please log in) |
| DN275CF (13.25" OD) | | Blank | 1.12 | 41 | DFF1325X000 | P.O.R. | | (please log in) |
| DN275CF (13.25" OD) | | 10.03 | 1.12 | 18 | DFF1325X1000 | P.O.R. | | (please log in) |
| DN16CF (1.33" OD) | | Blank | 0.28 | 0.5 | DFF133X000 | $28.90 | | (please log in) |
| DN16CF (1.33" OD) | | 0.63 | 0.28 | 0.5 | DFF133X062 | $28.90 | | (please log in) |
| DN25CF (2.125" OD) | | Blank | 0.47 | 0.75 | DFF212X000 | $50.00 | | (please log in) |
| DN25CF (2.125" OD) | | 1 | 0.47 | 0.75 | DFF212X100 | $52.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | Blank | 0.5 | 0.75 | DFF275X000 | $52.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1.51 | 0.5 | 0.75 | DFF275X150 | $52.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1.51 | 0.75 | 0.75 | DFF275X150S | $66.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1.51 | 1 | 1 | DFF275X150SS | $78.00 | | (please log in) |

- Microbeam-7C Saddlefield Ion and Fast Atom Source mounted on a standard NW38CF (70 mm OD). E.g. Part # ZMB-7 ($4,800) from 1550 Pond Rd, Suite 110, PO Box 3129 Allentown, PA 18104, Tel: (610) 366-7103 Fax: (610) 366-7105, E-mail: info@microphotonics.com Web site: www.microphotonics.com. This same model of ion gun has been sold through Oxford Applied Research and VSW/Atomtech.

Ion Sources

**Saddle Field**

The Saddle Field source is a cold cathode discharge device in which electrons are induced to oscillate between two electrodes under the action of a DC field.
These sources have no magnetic fields and no filaments, and therefore suffer none of the disadvantages associated with filament failure and the effects of magnetic fields in an experimental environment.



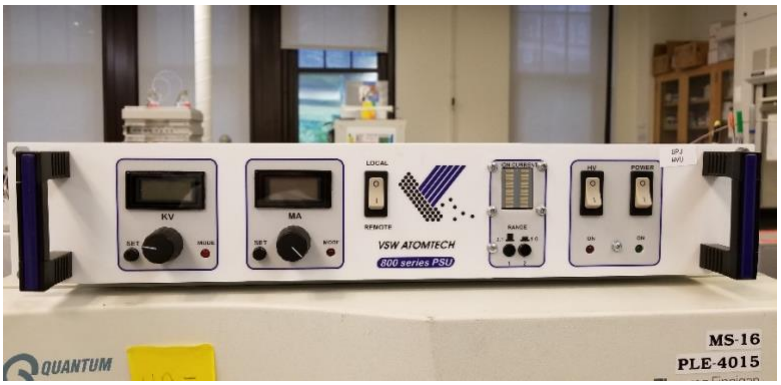
**Microbeam-7** Saddle Field sources are advanced compact ion and fast atom sources for use in a wide range of applications where small size and high beam intensity are required.

Applications include small scale substrate cleaning and etching, ion beam sputtering of thin films, Transmission Electron Microscope specimen thinning, fast atom bombardment (FAB) for mass spectrometry and secondary ion mass spectrometry.

Microbeam-7 sources are available as an internal mount version (Microbeam-7) and also as a UHV flange mounted version (Microbeam-7C). They consist of a source body and the necessary short and long cathodes for operation in either ion source mode or fast atom source mode.

The simple construction of these sources enables rapid change of cathodes and easy maintenance. For reactive applications special graphite cathode packs are available in addition to the standard cathode packs.

- Oxford Analytical Research 10 kV power supply for the ion gun (we used the previous model; VSW Atomtech 800 series PSU).




We have also used cheaper 10 kV power supplies from Advanced Energy Inc. (Ronkonkoma, NY): DEI: 10HVA24-BP1-WS


~$2,500

- High voltage cable AWM 3239 105C 40kvDC VW-1 from Matsusada Precision Inc. (Bohemina, NY) or DEI.

~$200

- Behlke Fast High Voltage Transistor Switch: HTS 101-03. This unit will enable you to pulse (switch) the steady-state DC power supply from ground to high voltage with very fast rise times (<1 ms).
  ~$1,100


- 1.33” Conflat to ¼” Swagelok adapter (or to whatever size is compatible with your He inlet gas line). On Lesker.com, you may have to search for “CF to swagelok adaptor” if the link below doesn’t work). (https://www.lesker.com/newweb/flanges/adapters_fittings_swagelok.cfm?pgid=cf ($59)

**CF to Swagelok® Adapter**

ENLARGE

Flange to Swagelok fitting adapters allow the mating of one type of flange system to a Swagelok fitting. All of our flange to fitting adapters are manufactured from 304 series stainless steel (unless otherwise noted).

**Flange to Swagelok Adapter Features:**

- Swagelok fittings provide a torque-free seal at all tubing connections which eliminates hazardous leaks
- Adapters available in either CF or KF flange terminations
- CF flanged adapters are UHV compatible

**Got VacuCAD℠?**

VacuCAD is a free library containing thousands of 2D CAD drawings (in DXF format) and 3D Models (in STP format) for many of our standard vacuum components and chambers. Please Log in

**Ordering Table**

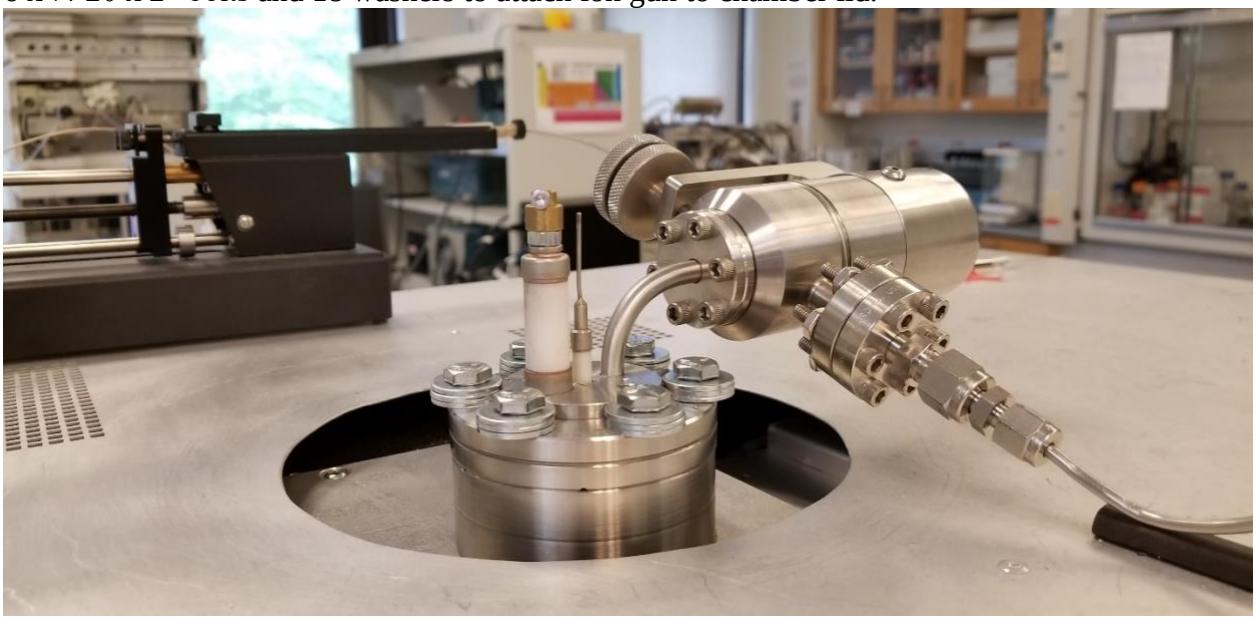
Click To Show Metric Units — All dimensions listed in the table below, unless otherwise stated, are in inches.

(Click column headers to sort data)

| Flange Size/OD | Drawing | Fitting | Weight lbs | PartNo | Price | Add Item | VacuCAD℠ |
|---|---|---|---|---|---|---|---|
| DN16CF (1.33" OD) | | 1/16" Swagelok | 0.5 | F0133X1SWG | $64.00 | | (please log in) |
| DN16CF (1.33" OD) | | 1/8" Swagelok | 0.5 | F0133X2SWG | $59.00 | | (please log in) |
| DN16CF (1.33" OD) | | 1/4" Swagelok | 0.5 | F0133X4SWG | $65.00 | | (please log in) |
| DN16CF (1.33" OD) | | 3/8" Swagelok | 0.5 | F0133X6SWG | $76.00 | | (please log in) |
| DN16CF (1.33" OD) | | 1/2" Swagelok | 0.5 | F0133X8SWG | $86.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1/16" Swagelok | 1 | F0275X1SWG | $64.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1/8" Swagelok | 1 | F0275X2SWG | $64.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1/4" Swagelok | 1 | F0275X4SWG | $71.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 3/8" Swagelok | 1 | F0275X6SWG | $87.00 | | (please log in) |
| DN35CF-DN40CF (2.75" OD) | | 1/2" Swagelok | 1 | F0275X8SWG | $89.00 | | (please log in) |
| Flange Size/OD | Drawing | Fitting | Weight lbs | PartNo | Price | Add Item | VacuCAD℠ |

- Reusable Fluorocarbon Gaskets for 1.33”and 2.75” conflats. https://www.lesker.com/newweb/flanges/hardware_cf_gaskets.cfm?pgid=fluorocarbon2 ($5 each). These will work just as well as copper gaskets.

- 6 x ¼-20 x 2” bolts and 18 washers to attach ion gun to chamber lid.



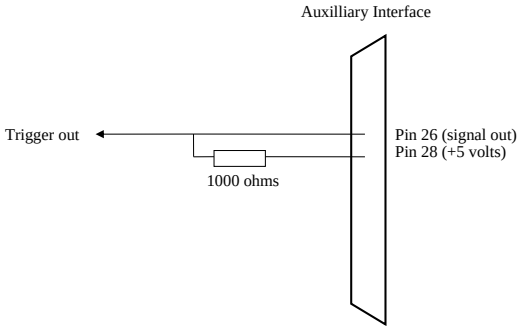
- Conflat screws to connect 1.33” Conflat from ion gun to leak valve., https://www.lesker.com/newweb/flanges/hardware_cf_boltkits.cfm?pgid=12pt1

- Screws and nuts needed to connect conflat on leak valve to conflat/ Swagelok adapter

- Bruker auxiliary cable with home-made BNC attachment. Triggers off Pins 26 and 28 (See below: Contact Bruker for details). Also need to take common ground from a separate pin.


- 1 k Ω resistor 0.25 W https://www.digikey.com/product-detail/en/stackpole-electronics-inc/CF14JT1K00/CF14JT1K00CT-ND/1830350 $0.10
  Digi-Key Part #: CF14JT1K00CT-ND

  Schematic for trigger from pins 26 (signal) & 28 (float)

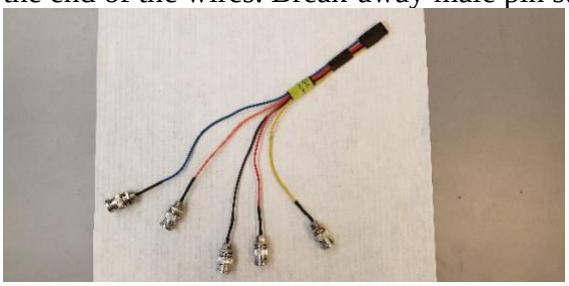


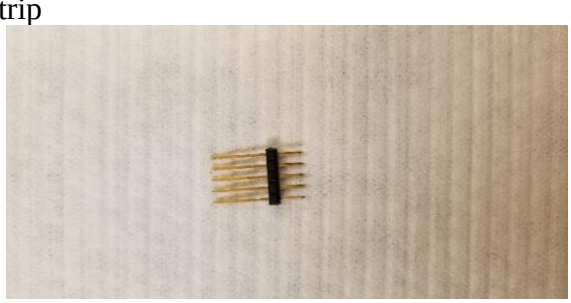

Description: Pin 26 is connected to an open collector.
The states can only be: ground or open.
To get a TTL signal a pull-up resistor is needed (1000 ohms).

- 11 BNC straight plug solder cup connectors
- 4 BNC cables
- 2 female BNC adapters and 1 T adapter (2F, 1M)

- 4 mm connectors (banana clips), banana plugs and cables to connect the Tenma DC power supply to the Behlke high voltage pulser.

- Connector that attaches to self-latching AMP-MODU to enable voltages and triggers to the Behlke high voltage switcher. Connector should have BNC connections soldered onto the end of the wires. Break-away male pin strip





- Arbitrary function generator (AFG). We have also used Agilent (33220A, now sold as Keysight 33511B $2,100) function generator in the past, too. It is possible to operate the Behlke pulser directly form the Amazon external trigger. However, we recommend an AFG so that you can have more control when timing the ion beam with the scan function.

- Two-channel (minimum) digital Oscilloscope (We used a Rigol DS1054 oscilloscope). $350.
https://www.amazon.com/gp/product/B012938E76/ref=ox_sc_sfl_title_1?ie=UTF8&psc=1&smid=A3DLN7K1UTIF0F


- 2 x 24 V power supplies. We used a dual-output Tenma 72-8690A 0-32 V 0-3 A power supply and home-made banana-plug to BNC cables. https://www.amazon.com/Variable-0-32V-Power-Supply-Output/dp/B011OMFUM0/ref=sr_1_5?s=industrial&ie=UTF8&qid=1501535574&sr=1-5&keywords=tenma+power+supply
$300 each


- 120 Ω resistor (must be rated for greater than 1W) to prevent overcurrent (arcs) in the ion gun. We use a 5 W ceramic resistor. https://www.digikey.com/product-detail/en/yageo/SQP500JB-120R/120W-5-ND/18681 $0.63 Digi-Key Part #: 120W-5-ND

- Circuit diagram and complete CTD setup on next page