Ionizers and Ion Optics

Ionizer Selection Guide

There are many possible configurations available for ionization. Use the selection chart below as a quick reference guide. The selection chart is followed by more detailed descriptions of the various ionization sources.

Ionizer Selection Chart					
Type	**Sensitivity**	**Abundance Sensitivity**	**Ionization/ Design Type**	**Mounting**	**Typical Applications**
Axial Molecular Beam	Good	Very Good	EI/Open	Axial	General Purpose
Axial RGA	Very Good	Poor	EI/Open	Axial	Gas Analysis
Cross Beam Deflector / Ionizer	Good	Very Good	EI/Open	Right Angle	Molecular Beam, Plasma/CVD Analysis, High Particulate
Closed Source	Good	Good	EI/CI/Closed	Right Angle	Gas Analysis
Atmospheric Pressure Ionization	Excellent	Fair	CI/Closed	Axial	High Purity Gas Analysis, Atmospheric Studies

Typical RGA and molecular beam applications utilize an ***axial molecular beam ionizer.*** If the species to be analyzed is either highly reactive or condensable, then a ***cross beam deflector ionizer*** is recommended. Where energy analysis of pre-formed ions is desired, either ***a cross beam deflector ionizer*** or ***tandem ionizer/axial energy filter*** is recommended, depending on the required orientation.

The axial energy filter comes with two ionization options, either a proper ionizer, **(tandem ionizer),** which will demonstrate excellent peak shape and sensitivity or a crude ionization scheme where a filament is located inside the energy filter, **(coaxial energy filter with RGA element)**, suitable only for residual gas analysis and validation of system operation.

In a few cases where a customer wants to sacrifice peak shape to improve sensitivity, an ***RGA ionizer*** may be used. Since abundance sensitivity suffers dramatically with the use of this ionizer, it is not recommended for use without an energy filter such as a quadrupole deflector. Indeed, when it is desired to fit a ***quadrupole deflector energy filter*** with an ionizer into a six inch tube eight inch flange, the ***RGA ionizer*** is the only choice. Other ionizers are too long to fit transverse inside a six inch tube when mounted to a quadrupole deflector. Note that such a configuration is available in the form of a **cross beam deflector ionizer**, which will fit inside a four inch O.D.tube.

When it is desired to ionize gaseous species at higher operating pressures either to improve ion analyte intensity versus background, or for chemical ionization, a ***Chemical Ionization Source*** which is closed source direct inlet ionizer is available.

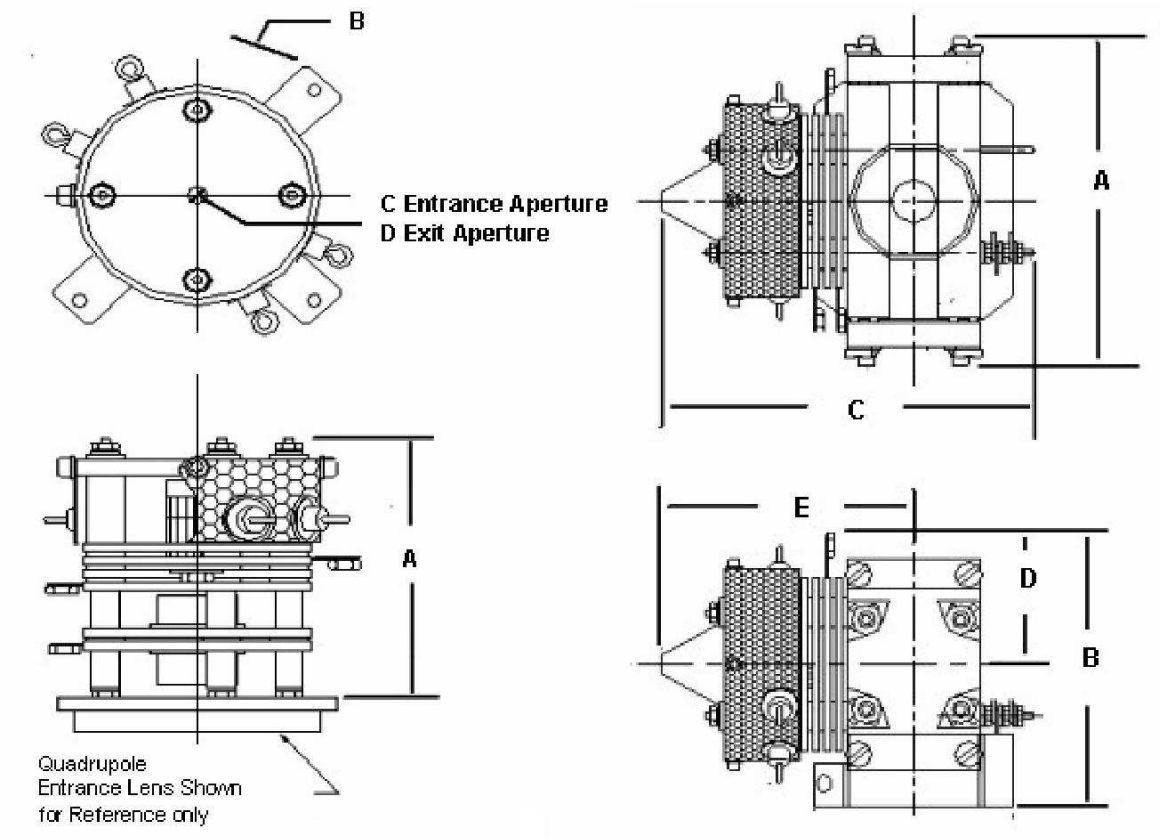
The ***Atmospheric Pressure Ionization Source,*** is suggested when very high sensitivity is required for detection trace contaminates in UHP gases or atmospheric samples.

When sampling pre-formed ions from either a surface or from within a cone of a multi-stage molecular beam system, a ***sampling cone*** is recommended at the entrance to the ionizer. Otherwise, a ***flat aperture*** is generally suitable.

When working within a UHV chamber where it is desired to minimize the contribution of background species to ion signal, a ***solid shield*** around the filament assembly is often used. For most molecular beam applications, it is desirable to maximize the pumping around the open ion volume, and thus a ***mesh filament shield*** is more commonly chosen.

Thoriated Iridium filaments offer higher performance in general, having lower filament voltage drops for appearance potential work, and less required heat to minimize outgassing in UHV systems. For a very few cases including the analysis of halogenated species, ***Tungsten filaments*** are a better choice. For routine non-UHV work, ***Tungsten filament*** performance is generally adequate.

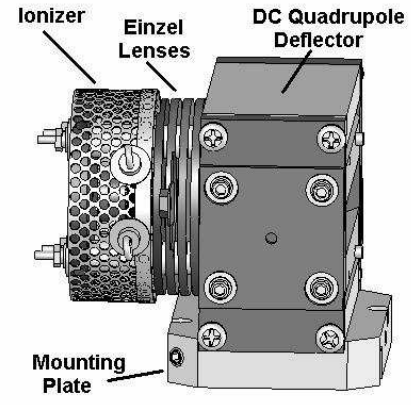
Please Note: Most ionizers can be operated using four of the lens power supplies that come with our MAX and MAX-LT. The exceptions to this are the Cross Beam Deflector Ionizers (page 37), the Tandem Ionizer / Energy Filter for Molecular Beam (page 39) and the Atmospheric Pressure Ionization Source (page 38). These ionizers require an additional Lens Power Supply in the Merlin Automation Controller The Lens Power Supplies are listed on page 24 of this price list.



Cross Beam Deflector Ionizer

Axial Molecular Beam Ionizer Shown with Sampling Cone and Mesh Shield Shown with Flat Aperture and Mesh Shield

Ionizer Dimensions in mm							
Type	**Part Number**	**No. of Lens Supplies**	**A**	**B**	**C**	**D**	**E**
Axial	812417	4	43.87	65	3.17	12.70	N/A
	812418	4	43.87	65	3.17	12.70	N/A
	812419	4	57.91	65	3.17	12.70	N/A
	812420	4	57.91	65	3.17	12.70	N/A
	812421	4	43.87	65	3.17	12.70	N/A
	812422	4	43.87	65	3.17	12.70	N/A
	812423	4	57.91	65	3.17	12.70	N/A
	812424	4	57.91	65	3.17	12.70	N/A
RGA	814594	3	28.70	65	3.17	4.77	N/A
	xxxxxx	3	28.70	65	3.17	4.77	N/A
Closed	139101	3	38.86	65	N/A	13	N/A
Cross Beam Deflector Ionizer	813960	5/6	71.88	60.02	66.06	28.85	43.20
	813961	5/6	71.88	60.02	66.06	28.85	43.20
	813962	5/6	71.88	60.02	75.41	28.85	52.55
	813963	5/6	71.88	60.02	75.41	28.85f	52.55
	813964	5/6	71.88	60.02	66.06	28.85	43.20
	813965	5/6	71.88	60.02	66.06	28.85	43.20
	813966	5/6	71.88	60.02	75.41	28.85	52.55
	813967	5/6	71.88	60.02	75.41	28.85	52.55
Cross Beam	812433	4	43.87	65	3.17	12.70	N/A
	812434	4	43.87	65	3.17	12.70	N/A
Axial Energy Filter	811563	3	88.90	66.02	5.99	8	N/A
	812435	3	88.90	66.02	5.99	8	N/A
	812436	3	88.90	66.02	5.99	8	N/A
Tandem Axial Ionizer Energy Filter	812437	5	117.15	66.02	3.17	8	N/A
	812438	5	117.15	66.02	3.17	8	N/A
	812439	5	117.15	66.02	3.17	8	N/A
	812440	5	117.15	66.02	3.17	8	N/A
	812441	4	107.03	66.02	5.99	8	N/A
	812442	4	107.03	66.02	5.99	8	N/A
	812443	4	107.03	66.02	5.99	8	N/A
	812444	4	107.03	66.02	5.99	8	N/A
Einzel Lens	812174	2/3	27.94	65	12.70	12.70	N/A



Cross Beam Deflector Ionizer Components

Axial Molecular Beam Ionizers

High efficiency, high sensitivity electron ionizers with four (4) filaments and an Einzel Lens Stack for tight beam focusing.

Part #	Description
812417	**Axial Molecular Beam Ionizer**, *Flat Aperture, Solid Shield and Tungsten Filaments*
812418	**Axial Molecular Beam Ionizer,** *Flat Aperture, Solid Shield and Thoriated Iridium Filaments*
812419	**Axial Molecular Beam Ionizer**, *Sampling Cone, Solid Shield, Tungsten Filaments*
812420	**Axial Molecular Beam Ionizer**, *Sampling Cone, Solid Shield, Thoriated Iridium Filaments*
812421	**Axial Molecular Beam Ionizer**, *Flat Aperture, Mesh Shield and Tungsten Filaments*
812422	**Axial Molecular Beam Ionizer**, *Flat Aperture, Mesh Shield and Thoriated Iridium Filaments*
812423	**Axial Molecular Beam Ionizer**, *Sampling Cone, Mesh Shield, Tungsten Filaments*
812424	**Axial Molecular Beam Ionizer**, *Sampling Cone, Mesh Shield, Thoriated Iridium Filaments*

RGA Ionizers

High sensitivity ionizer with less well defined peak shape than the Molecular Beam Ionizer. These ionizers are suitable for coupling with a quadrupole deflector energy filter, or where peak shape and abundance sensitivity are unimportant.

Part #	Description
814594	**RGA Ionizer**, (Increased sensitivity, poor abundance sensitivity) *Flat Aperture, Mesh Shield and Tungsten Filaments*
xxxxxx	**RGA Ionizer**, (Increased sensitivity, poor abundance sensitivity) *Flat Aperture, Mesh Shield and Thoriated Iridium Filaments*

Chemical Ionization Source

High Pressure closed source direct inlet ionizer for chemical ionization, or for improved analyte sensitivity relative to background.

Part #	Description
139101	**400-R2 Direct inlet Ionizer** *(quad mounted with one each one hole EI ion volume)*

Cross Molecular Beam Ionizers

The Cross Beam Deflector Ionizer combines a high efficiency, high transmission axial electron impact ionizer with a quadrupole deflector energy filter (energy resolution of 0.6 eV) for improved signal to noise, energy filtering, and stable right angle operation. Signal-to-noise is improved by removing electrons, photons, high energy neutrals and other noise sources from the ion signal. The tunable quadrupole deflector allows for increased stability by preventing deposition of corrosives and condensables on the quadrupole mass filter and detector. Allows for right angle operation with maximum signal transmission. For more information, ask for application notes GP-510 and GP-511.

The Cross Beam Deflector Ionizers are ideal for use in demanding applications such as plasma etch and CVD monitoring, attaching a QMS to an electrospray or GC, Molecular Beam work, or wherever space is limited.

Please Note: Most ionizers can be operated using the six lens power supplies supplied as standard with the MAX systems. The Cross Beam Deflector Ionizers require one or two additional lens supplies. Please see pages 22 and 24 and for additional lens supplies.

Part #	Description
813960	**Cross Beam Deflector Ionizer.** *Flat Aperture, Solid Shield, Tungsten Filaments.*
813961	**Cross Beam Deflector Ionizer.** *Flat Aperture, Solid Shield, Thoriated Iridium Filaments.*
813962	**Cross Beam Deflector Ionizer.** *Sampling Cone, Solid Shield, Tungsten Filaments.*
813963	**Cross Beam Deflector Ionizer**. *Sampling Cone, Solid Shield, Thoriated Iridium Filaments.*
813964	**Cross Beam Deflector Ionizer**. *Flat Aperture, Mesh Shield, Tungsten Filaments.*
813965	**Cross Beam Deflector Ionizer.** *Flat Aperture, Mesh Shield, Thoriated Iridium Filaments.*
813966	**Cross Beam Deflector Ionizer**. *Sampling Cone, Mesh Shield, Tungsten Filaments.*
813967	**Cross Beam Deflector Ionizer** *Sampling Cone, Mesh Shield, Thoriated Iridium Filaments.*
812433	**Cross Beam Ionizer for Photo Ionization Studies**. *Solid Shield, Tungsten Filaments.*
812434	**Cross Beam Ionizer for Photo Ionization Studies.** *Solid Shield, Thoriated Iridium Filaments.*

Atmospheric Pressure Ionization Source, Optics and Accessories

Chemical Ionization Source for high sensitivity, parts per trillions, of impurities in UHP gases or atmospheric pollutants.

Part #	Description

812895 **Atmospheric Pressure Ionization (APIMS) Source**. O-ring Mounting *Flange, Discharge Needle, Discharge Volume Heater, Gas sampling ports, Declustering Lens, and Skimmer. (Does not include heater supply, discharge power supply, pumps or plumbing) All Metal sealed for ultra-trace gas analysis.*

813302 **Skimmer and Declustering Lenses** *does not include sample block and discharge needle assembly.*

811587 **API Focusing Lens Assembly** *socket mount, requires mating connector*

686201 **Mating socket for API focusing lens,** *includes vacuum Teflon coated wiring and 10 pin mini flange connector*

812987 **Isolated Top Hat**

Q-131 Top Hat locating rods *to provide guidance for inserting the mass filter through the top hat.* ***Two required per system***

667001 **APIMS Front Chamber** *O'ring sealed*

666901 **APIMS Rear Chamber** *O'ring sealed*

xxxxxx **APIMS Specially Vented Mass Filter Housing** *APIMS systems are differentially pumped. The proper design of the mass filter housing requires it to be vented on the side of the partition toward the electron multiplier, and non-vented on the side toward the transfer lens assembly. Special mass filter housings are also available.*

U-763 **Quadrupole Mounted API Focusing Lens Assembly** *For use with SpectrEL quad entrance lens assembly. Mass Cylinder aperture diameter is 1 inch*

076301 **Quadrupole Mounted API Focusing Lens Assembly** *For use with SpectrEL quadrupole entrance lens assembly. Mass Cylinder aperture diameter is 0.5 inch*

xxxxxx **SpectrEL Entrance Lens Assembly** *for 9.5 mm Quadrupole Mass Filters*

xxxxxx **SpectrEL Entrance Lens Assembly** *for 19 mm Quadrupole Mass Filters*

Axial Energy Filter / Tandem Ionizers

These beam stop type energy filters have been optimized for fine energy filtering (energy resolution to less than one eV) and noise reduction. The bias-able internal beam stop reduces noise from photons, electrons, high energy neutrals and high energy ions. The Surface Science version is optimized for SIMS . The Molecular Beam version is designed for plasma monitoring, and combustion studies.

Please Note: Most ionizers can be operated using the six lens power supplies supplied as standard with the MAX systems. The Tandem Ionizer / Energy Filter requires and additional one or two lens supplies. The Lens Power Supplies are listed on pages 22 and 23 and of this price list.

Part #	Description
811563	**Coaxial Energy Filter**, *No Filaments*
812435	**Coaxial Energy Filte**r with Tungsten RGA Filament
812436	**Coaxial Energy Filt**er with Thoriated Iridium RGA Filament
812437	**Tandem Ionizer / Energy Filter**, **Surface Science**, *Sampling Cone, Solid Shield, Tungsten Filaments*
812438	**Tandem Ionizer / Energy Filter, Surface Science**, *Sampling Cone, Solid Shield, Thoriated Iridium Filaments*
812439	**Tandem Ionizer / Energy Filter, Surface Science**, *Sampling Cone, Mesh Shield, Tungsten Filaments*
812440	**Tandem Ionizer / Energy Filter, Surface Science**, *Sampling Cone, Mesh Shield, Thoriated Iridium Filaments*
812441	**Tandem Ionizer / Energy Filter, Molecular Beam**, *Flat Aperture, Solid Shield, Tungsten Filaments*
812442	**Tandem Ionizer / Energy Filter, Molecular Beam**, *Flat Aperture, Solid Shield, Thoriated Iridium Filaments*
812443	**Tandem Ionizer / Energy Filter, Molecular Beam**, *Flat Aperture, Mesh Shield, Tungsten Filaments*
812444	**Tandem Ionizer / Energy Filter, Molecular Beam**, *Flat Aperture, Mesh Shield, Thoriated Iridium Filaments*

Entrance Lens Assemblies for Tandem Ionizer

The following lenses must be used when mounting a Axial Energy Analyzer or a Tandem Axial Energy Analyzer to and Extrel Quadrupole Mass Filter.

Part #	Description
811808	**Entrance Lens for Mounting Axial Energy Analyzer to 9.5mm quadrupole**
811568	**Quadrupole Entrance Lens for Mounting Axial Energy Analyzer to 16 mm quadrupole**
811636	**Quadrupole Entrance Lens for Mounting Axial Energy Analyzer to 19 mm quadrupole**

Ion Deflectors and Ion Optics

The following items can be to any of Extrel components or can be used as component parts in other mass spectrometer systems. Power can be supplied from the Merlin Automation 3500, 5500 and 5221 Series Controllers using the Lens Power Supplies. The customer can also supply the appropriate voltages from any stable DC power supply. See page 48 for more detailed information and dimensions.

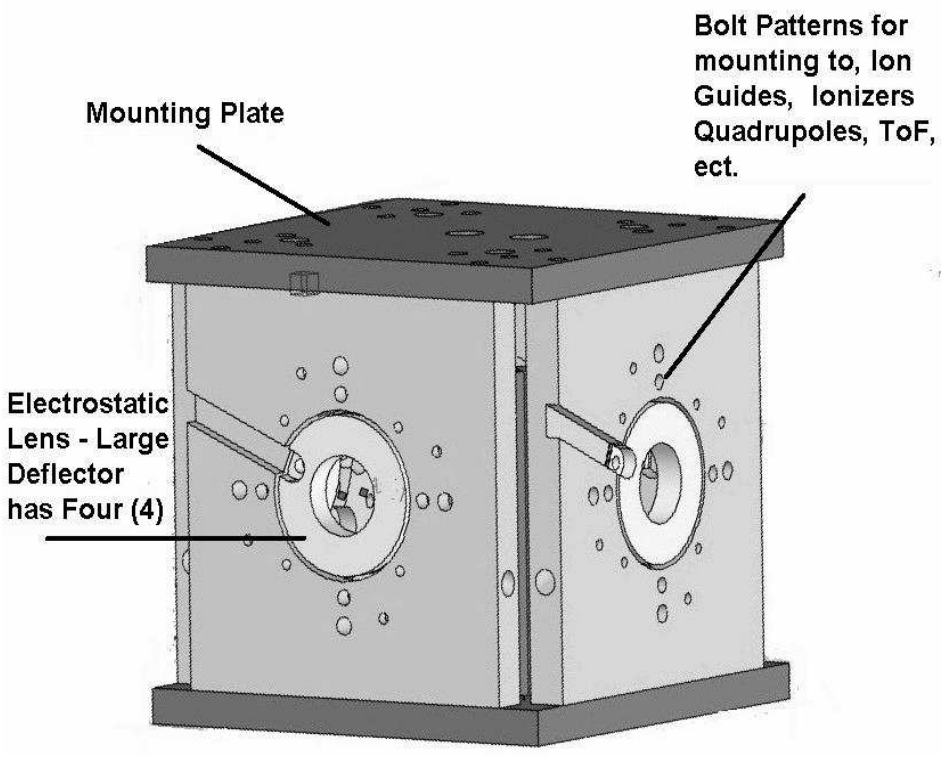
Part #	Description

811989 **Quadrupole Deflector / Energy Filte**r. *Ions can be sent 90°, 180° or 270° from entry axis, requires 150 mm (6 inch) I.D. tube for insertion.*

814715 **Compact Quadrupole Deflector / Energy Filter** *ion can be deflected 90° from entry axis*

812174 **Einzel Lens Stack**

814150 **Custom Ion Optics Lens Designs**



Details of the Large Deflector