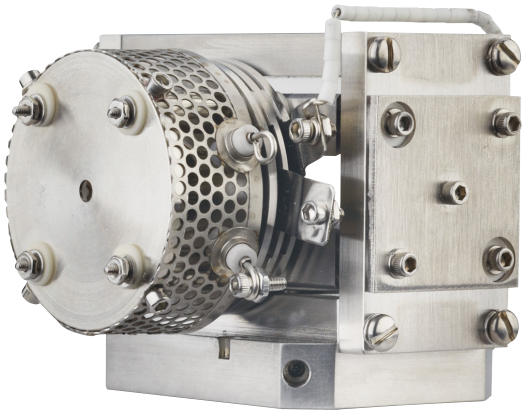
Extrel

2014/2015 Research Components Catalog



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How to Use This Product Guide

This document is divided into nine sections, each dealing with a particular range of products or subjects.

Section I: About Extrel: This section has Extrel Contact information.

Section II-VII: Mass Spectrometry Components: These sections consist of the individual parts that make up a Quadrupole Mass Spectrometer, MS/MS components, and specialized application-specific components. These components can be used as options for the systems listed in Section I, to build up specialized Mass Spectrometer systems or to modify and upgrade the performance of existing systems. The sections include:

- SECTION II IONIZERS & ION OPTICS
- SECTION III: MASS FILTERS & ION GUIDES
- SECTION IV: DETECTORS, DETECTOR HOUSINGS, AND PRE-AMPS
- SECTION V: RF/DC AND RF-ONLY POWER SUPPLIES
- SECTION VI: SOFTWARE & CONTROLLERS
- SECTION VII: FLANGES AND MOUNTING OPTIONS

Section VIII: Custom Equipment: With over 50 years of experience, Extrel has the technical and engineering expertise to design and build custom Systems, Chambers and Components specifically for your application.

Section IX: Technical Support and Training Classes: This section has a list of installation, support services, and training classes available from Extrel.

How to Order

Contact your nearest Extrel representative for additional information, complete specifications or a quotation. Please refer to the original quotation number in your correspondence, inquiries and orders. Please see pages v and vi for a list of your local sales representatives.

Terms and Conditions

All orders are subject to final acceptance by Extrel and acceptance of Extrel's Terms and Conditions. Please contact your local Extrel Representative for a copy of our Terms and Conditions. It will be the customer's responsibility to determine if the product is suitable for the purpose intended. All Transactions are in United States Dollars. Purchaser is responsible for any applicable duties, taxes and fees. Payments can be made using MasterCard or Visa with approval. All orders are shipped F.C.A. Pittsburgh, Pennsylvania, U.S.A. via most economical carrier, unless other methods are specified by the customer. All prices are subject to change without notice.

Warranty and Installation

Extrel warrants its Components and systems against defects in material and workmanship for a period of 12 months from date of shipment. Please contact our service department if you have any questions about the items you received or need service assistance.

Note: All items returned must have a Return Authorization number before being shipped back to Extrel.
Prices do not include installation and training. Please see Section VI or contact Extrel for pricing and scheduling of installation and training.

Extrel

Extrel Information

Extrel has been a center of excellence and innovation for 50 years. Extrel looks to inspire a new generation of scientists and innovators with our wide technology and application breadth.

About Extrel

Extrel was founded in 1964 under the name Extranuclear Laboratories as a start-up by a professor and his colleague from the University of Pittsburgh. Dr. Wade Fite, a professor of physics at the university, had developed a stable RF power supply for the Quadrupole Mass Filters he was using for his Molecular Beam experiments. The news of Dr. Fite's reliable power supplies quickly spread through the scientific community. He soon received so many requests for copies of them that he decided he needed to start the business to handle the requirements of his colleagues.

The company grew quickly and became known worldwide for building Innovative, high-performance and high-quality instruments. The company expanded beyond building equipment for basic research and into process analysis and control equipment, bio and environmental analytical systems and industrial QA/QC instrumentation.

Today Extrel makes equipment for a wide range of research and industrial applications and are still known for our Innovation, High Performance, and High Quality Instrumentation. We not only build the large number of standard systems and components shown in this product guide but also have the experience and technical knowledge to build custom systems and components specifically for your application.

Research Sales Contact Information

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Note: If you are interested in becoming an Extrel Representative contact Extrel at sales@extrel.com

Ionizers and Ion Optics

Ionizer Selection Guide

There are many possible configurations available for ionization. The selection chart is a quick reference guide, and is followed by more detailed descriptions of the various ionization sources to help clarify the different options.

Figure 1:

Cutaway of Tandem Ionizer

The tandem ionizer can be used to prefilter ions by their ion energy before filtering by m/z with the quadrupole mass filter.

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	Residual 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 are either highly reactive or condensable, then a crossbeam deflector ionizer is recommended. Where energy analysis of pre-formed ions is desired, either a crossbeam 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:

1. a traditional ionizer, axial molecular beam ionizer, which will demonstrate excellent peak shape and sensitivity or

2. a crude ionization scheme where a filament is located inside the energy filter, axial RGA ionizer, 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. A configuration with very good abundance sensitivity is available in the form of a crossbeam deflector ionizer, which will fit inside a four-inch O.D. tube.

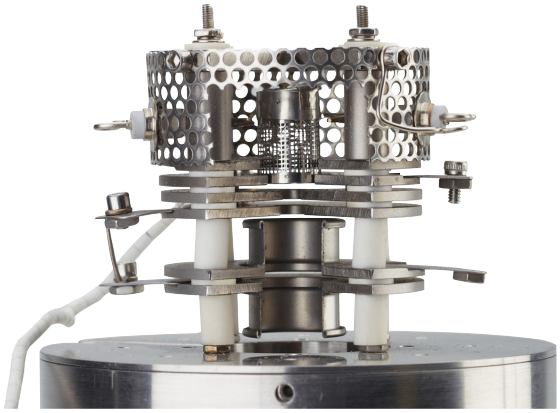
When it is desired to ionize gaseous species at higher operating pressures whether it be to improve ion analyte intensity versus background, or for chemical ionization, a Chemical Ionization Source--which is a closed source direct inlet ionizer--is available.

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, 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 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. In 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 7), the Tandem Ionizer/Energy Filter for Molecular Beam (page 8) and the Atmospheric Pressure Ionization Source (page 7). These ionizers require an additional Lens Power Supply in the Merlin Automation Controller. The Lens Power Supplies are listed on page 39 of this price list.



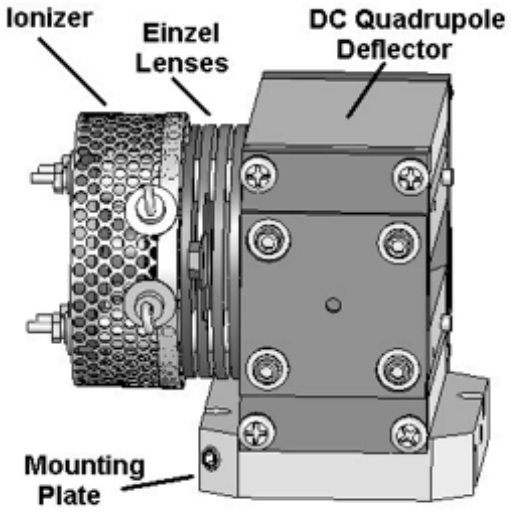
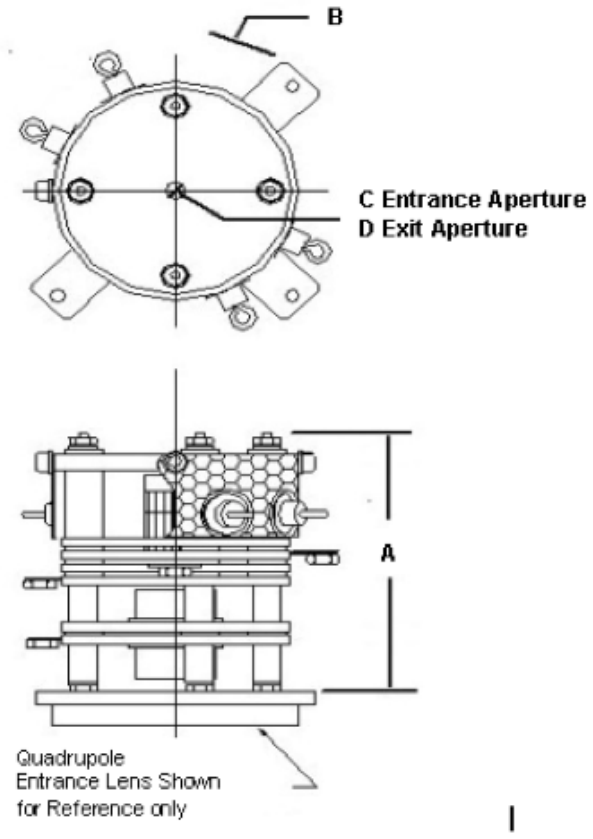
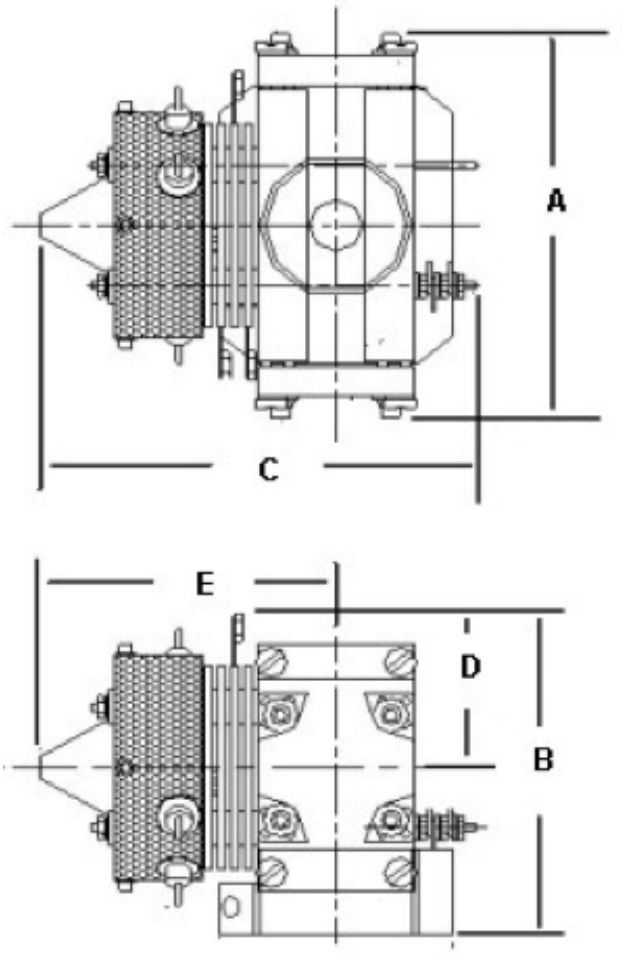


Figure 2 (Left) - Cutaway of an Axial Ionizer
Figure 3 (Above) - Cross Beam Deflector Ionizer Schematic



Axial Molecular Beam Ionizer
Shown with Flat Aperture and Mesh Shield



Cross Beam Deflector Ionizer
Shown with Sampling Cone 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	813960	5/6	71.88	60.02	66.06	28.85	43.20
Beam	813961	5/6	71.88	60.02	66.06	28.85	43.20
Deflector	813962	5/6	71.88	60.02	75.41	28.85	52.55
Ionizer	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	812433	4	43.87	65	3.17	12.70	N/A
Beam	812434	4	43.87	65	3.17	12.70	N/A
Axial	811563	3	88.90	66.02	5.99	8	N/A
Energy	812435	3	88.90	66.02	5.99	8	N/A
Filter	812436	3	88.90	66.02	5.99	8	N/A
Tandem	812437	5	117.15	66.02	3.17	8	N/A
Axial	812438	5	117.15	66.02	3.17	8	N/A
Ionizer	812439	5	117.15	66.02	3.17	8	N/A
Energy	812440	5	117.15	66.02	3.17	8	N/A
Filter	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

Axial Molecular Beam Ionizers

High-efficiency, high-sensitivity electron ionizers that have 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, and Tungsten Filaments
812420	Axial Molecular Beam Ionizer: Sampling Cone, Solid Shield, and 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, and Tungsten Filaments
812424	Axial Molecular Beam Ionizer: Sampling Cone, Mesh Shield, and Thoriated Iridium Filaments

RGA Ionizers

High-sensitivity ionizers which have a less well-defined peak shape and lower abundance sensitivity than the Molecular Beam Ionizers. 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 closed EI 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 condensable impurities on the quadrupole mass filter and detector. This enables 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 which are standard with the MAX systems. The Cross Beam Deflector Ionizers require one or two additional lens supplies. Please see pages 39 for additional lens supplies.

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

Atmospheric Pressure Ionization Source, Optics, and Accessories er Supply

Chemical Ionization Source for high sensitivity, of impurities in UHP gases or atmospheric pollutants (PPT detection).

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 are 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 biasable 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 which are standard with the MAX systems. The Tandem Ionizer/Energy Filter requires an additional one or two lens supplies. The Lens Power Supplies are listed on pages 39 of this price list.

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

Entrance Lens Assemblies for Tandem Ionizer

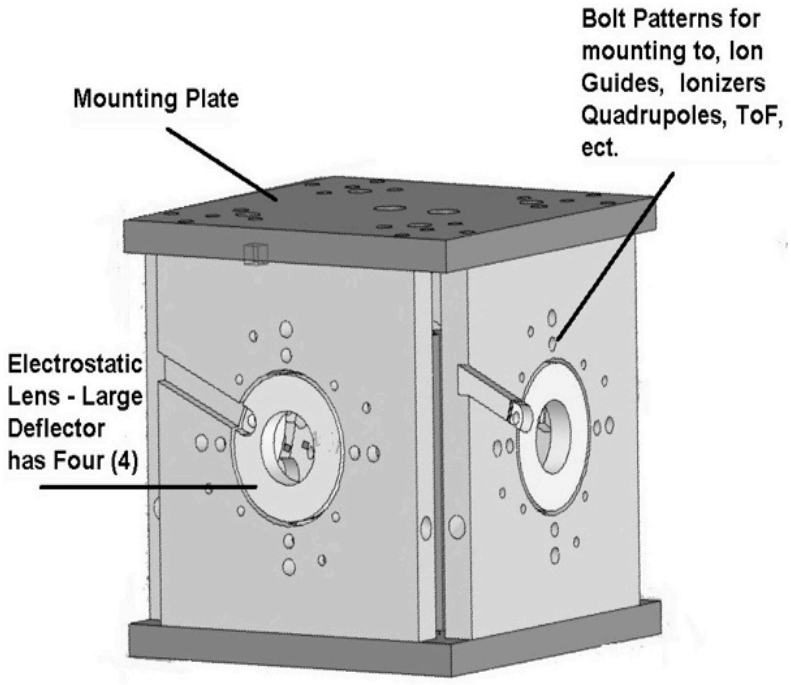
The following lenses must be used when mounting a Axial Energy Analyzer or a Tandem Axial Energy Analyzer to an Extrel Quadrupole Mass Filter.

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 added to any Extrel components or can be used as component parts in other mass spectrometer systems. Power can be supplied from the Merlin Automation CS Series Controller using the Lens Power Supplies. The customer can also supply the appropriate voltages from any stable DC power supply. See page 18 for more detailed information and dimensions.

Part #	Description
811989	Quadrupole Deflector/Energy Filter. (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. (Ions can be deflected 90° from entry axis)
812174	Einzel Lens Stack
814150	Custom Ion Optics Lens Designs



Ionizer Spare Parts

Unless otherwise noted, the parts listed in this section are designed for use in the current models of ionizers, including:

- ***Axial Molecular Beam Ionizers:*** ***(812417 - 812424)***
- ***Cross Beam Deflector Ionizers:*** ***(813960 - 813967)***
- ***Tandem Ionizers:*** ***(812437 - 812444)***

Some parts are also identified as suitable replacements for previous ionizer designs. Call Extrel Sales or Technical Support for any parts not listed.

Part #	Description
T-91	Spare ion region assembly with tab for axial molecular beam ionizer. Also fits 041-9, 041-11.
812583	Universal Ionizer Spares Kit. Contains ceramic washers (10), ruby balls (4), one coil of tungsten wire, and miscellaneous nuts and screws common to most Extrel ionizer assemblies.
812447	Spare Filament Assembly: Side-mounted, Mesh Shield, and Tungsten Filaments
812448	Spare Filament Assembly: Side-mounted, Mesh Shield, and Thoriated Iridium Filaments
812449	Spare Filament Assembly: Side-mounted, Solid Shield, and Tungsten Filaments
812405	Spare Filament Assembly: Side-mounted, Solid Shield, and Thoriated Iridium Filaments
PM-C-37	Spare Filament Wire: Tungsten. One-inch coil, enough to replace approximately five four-wire filament assemblies
PM-C-56	Spare Filament Wire: Thoriated Iridium. Note that most Extrel ionizers require four filaments per assembly
T-94	Spare Filament Assembly: 041-9 and 041-11 only. Top-mounted, Tungsten Filaments
279501	Spare Filament Assembly: 041-9 and 041-11 only. Top-mounted, Thoriated Iridium Filaments
xxxxxx	SERVICE REPAIR: Clean and repair filament assembly. Replace filaments with four Tungsten Filaments
xxxxxx	SERVICE REPAIR: Clean and repair filament assembly. Replace filaments with four Thoriated Iridium Filaments

Extrel

Multipole Devices

Mass Filters & Ion Guides

Figure 1: Multipole Devices

Extrel is an expert in multipole devices. From 19 mm quadrupoles to conical octupoles, Extrel can provide an ion guide for your aplication.

Extrel makes a wide range of high-precision multipole devices for a wide variety of applications. The multipoles are built with stainless rods and Alumina ceramic yokes. They are rugged enough to be baked to 300°C and can withstand repeated cleanings without any permanent changes to their operating characteristics.

Multipole Devices

Multipole devices can be categorized one of two ways:

- first as an ion guide, which uses RF power to transfer ions through the system efficiently; and
- second as a mass filter which, as the name suggests, actually filters the ions by mass by using both RF and DC power.

Extrel Mass Filters come standard with the following: RF-only, pre- and post-filters, entrance and exit lenses to increase ion transmission, and Stainless Steel housings, vented or unvented. Other configurations are available.

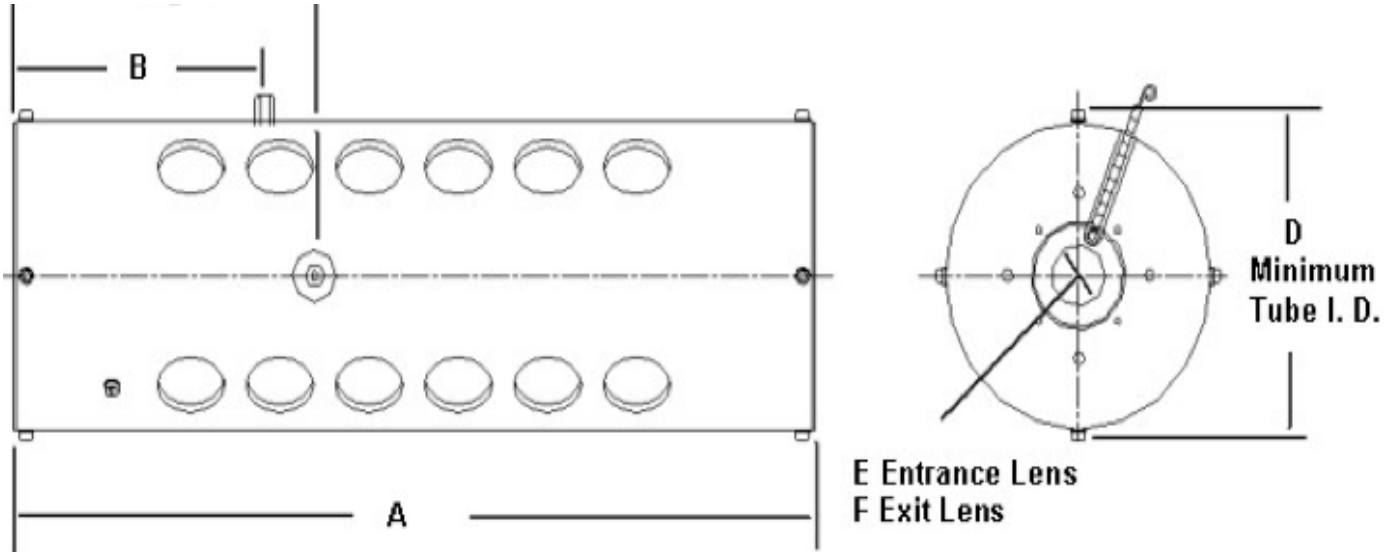
Mass range, sensitivity, abundance sensitivity, and resolution are determined by the quadrupole rod size and the RF operating frequency. Increasing either the quadrupole rod size or operating frequency increases the sensitivity, abundance sensitivity, resolution, and high-energy ion transmission and filtering. Decreasing the quadrupole rod size or the RF operating frequency increases the mass range.

The information below should be used as a rough guide for choosing the Quadrupole Mass Filter for your application. For more information contact your local Extrel Representative.

Table 1:
MAX System Mass Range and Performance

System	Quadrupole Mass Filter	Operating Frequency	Mass Range	Relative Transmission	Resolution (M/△M FWHM)	General Sensitivity (mA/Torr)
MAX-16000	9.5 mm (3/8 inch) Tri	440 kHz	20-16000	15%	1000	0.075
MAX-4000	9.5 mm (3/8 inch) Tri	880 kHz	10-4000	20%	1200	0.1
MAX-4000HT	19 mm (3/4 inch) Tri	440 kHz	4-4000	50%	1500	0.75
MAX-2000	9.5 mm (3/8 inch) Tri	1.2 MHz	2-2000	25%	1500	0.3
MAX-1000	19 mm (3/4 inch) Tri	880 kHz	1-1000	50%	1800	1
MAX-500	9.5 mm (3/8 inch) Tri	2.1 MHz	1-500	30%	2000	0.4
MAX-500HT	19 mm (3/4 inch) Tri	1.2 MHz	1-500	60%	2000	2
MAX-120	19 mm (3/4 inch) Tri	2.1 MHz	1-120	65%	2500	3
MAX-50	19 mm (3/4 inch) Tri	2.9 MHz	1-50	75%	3000	4

Note: Performance specifications shown here are minimum production test requirements. Actual performance may be better.



Quadrupole Dimensions in mm

Device	A	B	C	D	E	F
9.5 mm Quadrupole w/o Housing	200.07	78.61	93.85	54	NA	NA
9.5 mm Quadrupole w Housing	219	77.21	92.45	101	7.62	7.62
19 mm Quadrupole w/o Housing	210	62.73	78.98	63.5	NA	NA
19 mm Qudrupole w Housing	228	72.13	86.36	101	15.24	15.24

9.5 mm Quadrupole Mass Filters

Part # Description

813859 9.5 mm (3/8 inch) diameter quadrupole mass filter with UHV compatible pre- and post-filters, with stabilizing rods

813937 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 880 KHz 150-QC, standard housing, stabilizing rods, entrance and exit lens

813685 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 880 KHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

813771 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 1.2 MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814814 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 1.2 MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

.

814812 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 2.1MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814813 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 2.1MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

814812 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 2.9 MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814813 9.5 mm (3/8 inch) diameter quadrupole mass filter assembly with UHV compatible pre- and post-filters. For use with 2.9 MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

19 mm Quadrupole Mass Filters

Part # Description

814191 19 mm (¾ inch) diameter quadrupole mass filter with UHV Compatible pre- and post-filters, with stabilizing rods and no housing

814315 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 880 KHz 150-QC, standard housing, stabilizing rods, entrance and exit lens

814443 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 880 KHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

814192 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 1.2 MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814193 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 1.2 MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

.

814742 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 2.1 MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814745 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 2.1 MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

814796 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 2.9 MHz 150-QC standard housing, stabilizing rods, entrance and exit lens

814797 19 mm (3/4 inch) diameter quadrupole mass filter assembly with UHV Compatible pre- and post-filters. For use with 2.9 MHz 150-QC, vented housing, stabilizing rods, entrance and exit lens

MS/MS Components

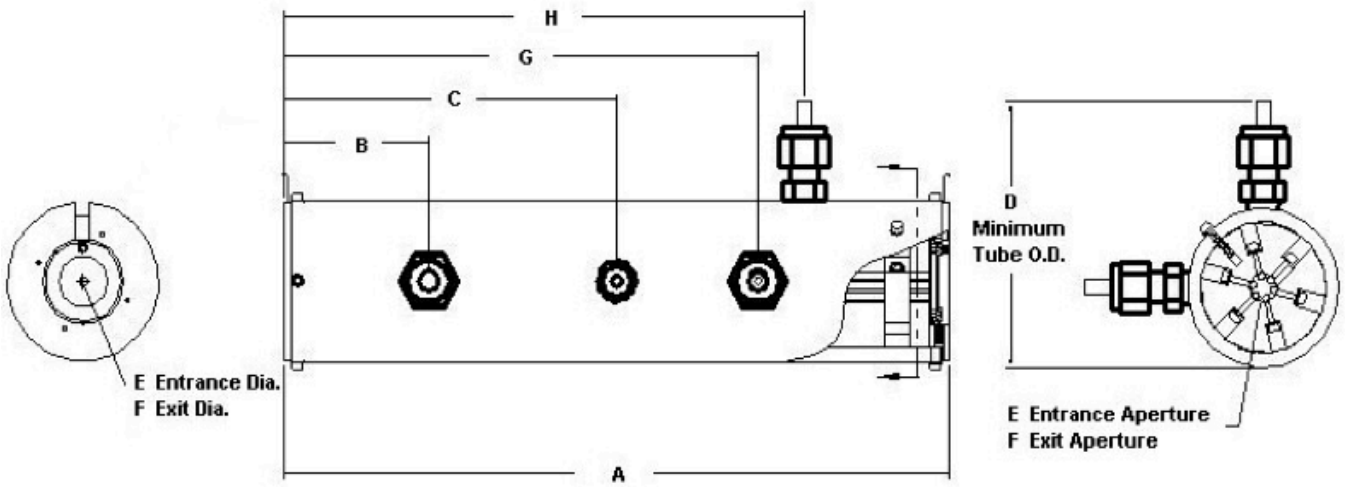
Extrel is unique in offering standard MS/MS components. These include double and triple Quadrupoles, QOQ devices, Quadrupole, Octupole or Hexapole Ion Guides and Collision Cells, Einzel Lens and Ion Deflectors.

Please see the Controllers on page 38, and the Control Modules page 39, for information on controlling MS/MS components.

For more information on our line of MS/MS components contact your local Extrel Representative.

MS/MS Component Dimensions in mm									
Device	Part Number	A	B RF	C Posts	D	E	F	G Gas	H Ports
9.5 mm Triple Quadrupole	810129	621	1	1	101	7.62	7.62	1	1
19 mm Triple Quadrupole	810058	635	1	1	101	15.24	15.24	1	1
QoQ with 9.5 mm Quadrupole	814828	625	1	1	101	7.62	7.62	1	1
QoQ with 19 mm Quadrupole	Xxxxxx	660	1	1	101	15.24	15.24	1	1
Qo with 9.5 mm Quadrupole and Hexapole	xxxxxx	422.27	1	1	101	7.62	4.5	N/A	N/A
Qo with 19 mm Quadrupole and Hexapole	812034	431.3	1	1	101	15.24	4.5	N/A	N/A
Octupole Ion Guide without Housing	813177	199.39	N/A	N/A	54	9.52	9.52	N/A	N/A
Octupole with Standard Housing, Entrance and Exit Lenses	Xxxxxx	219.2	156	171.45	101	2.8	2.8	N/A	N/A
Octupole with Vented Housing, Entrance and Exit Lenses	815491	219.2	156	171.45	101	2.8	2.8	N/A	N/A
Octupole Collision Cell	815882	219.2	156	171.45		2.8	2.8	47.75	109.47
Hexapole Ion Guide without Housing	xxxxxx	205.48	N/A	N/A	54	4.8	4.8	N/A	N/A
Hexapole with Standard Housing, Entrance and Exit Lenses	xxxxxx	219.2	156	171.45	101	2.8	2.8	N/A	N/A
Hexapole with Vented Housing, Entrance and Exit Lenses	xxxxxx	219.2	156	171.45	101	2.8	2.8	N/A	N/A

Please contact Extrel for complete dimensions.
Note: All dimensions are for reference only. Contact Extrel for final dimensions.



MS/MS Device Dimensions: Hexapole Collision Cell shown.

QoQ Devices and Double and Triple Quadrupoles

Complete MS/MS Mass Filters with one resolving Quadrupole Mass Filter for parent ions, followed by a Collision Cell, followed by another resolving Quadrupole Mass Filter for daughter ions.

Part # Description

814828 Quadrupole-Octupole-Quadrupole Mass Filter, 9.5 mm (3/8 inch) diameter rods with Vented Q1 and Q2 Housing, Entrance Lens on Q1 and Exit Lens on Q2, Octupole Collision Cell with Gas Port (Contains Teflon and Vespel Insulation)

xxxxxx Quadrupole-Octupole-Quadrupole Mass Filter, 19 mm (3/4 inch) diameter rods with Vented Q1 and Q2 Housing, Entrance Lens on Q1 and Exit Lens on Q2, Octupole Collision Cell with Gas Port (Contains Teflon and Vespel Insulation)

810129 Triple Quadrupole Mass Filter, 9.5 mm (3/8 inch) diameter rods with Vented Q1 and Q3 Housing, Entrance Lens on Q1 and Exit Lens on Q3, Q2 is a High Pressure Collision Cell with conductance limited Entrance and Exit Lenses and Gas Port (Contains Teflon and Vespel Insulation)

810058 Triple Quadrupole Mass Filter 19mm (3/4 inch) diameter rods with Vented Q1 and Q3 Housings, Entrance Lens on Q1 and Exit Lens on Q3, Q2 is a High Pressure Collision Cell with conductance limited Entrance and Exit Lenses and Gas Port (Contains Teflon and Vespel Insulation)

Ion Guides and Collission Cells, Octupole, and Hexapole

Extrel manufactures a range of Ion Guides for a number of different applications. These include Octupoles, Hexapoles, Quadrupoles and Einzel Lenses. Each device has a unique set of performance characteristics that make it ideal for the demands of a specific application. Additionally, all have the flexibility to perform well in many applications. Two or more of the devices are often combined together for the best possible performance.

All of Extrel's Ion Guides are rugged, high-precision devices built and tested to the most exacting specifications. They have standard configurations with several options and most can be customized to fit your application.

Part # Description

813177 Standard Length Octupole (no housing)

815402 Standard Length Hexapole (no housing)

816757 Octupole ion guide mounted into standard housing. Includes Entrance and Exit Lenses (high-transmission broad mass range ion guide)

815491 Octupole ion guide mounted into vented housing for pressure reduction. Includes Entrance and Exit Lenses (high-transmission broad mass range ion guide)

815882 Octupole Collision Cell mounted into standard housing with tapped hole for gas inlet port. Includes Vespel Sealed Entrance and Exit Lenses (high-transmission broad mass range collision cell for CID and collisional cooling)

xxxxxx Hexapole ion guide mounted into standard housing long. Includes Entrance and Exit Lenses (high-transmission broad mass range ion guide)

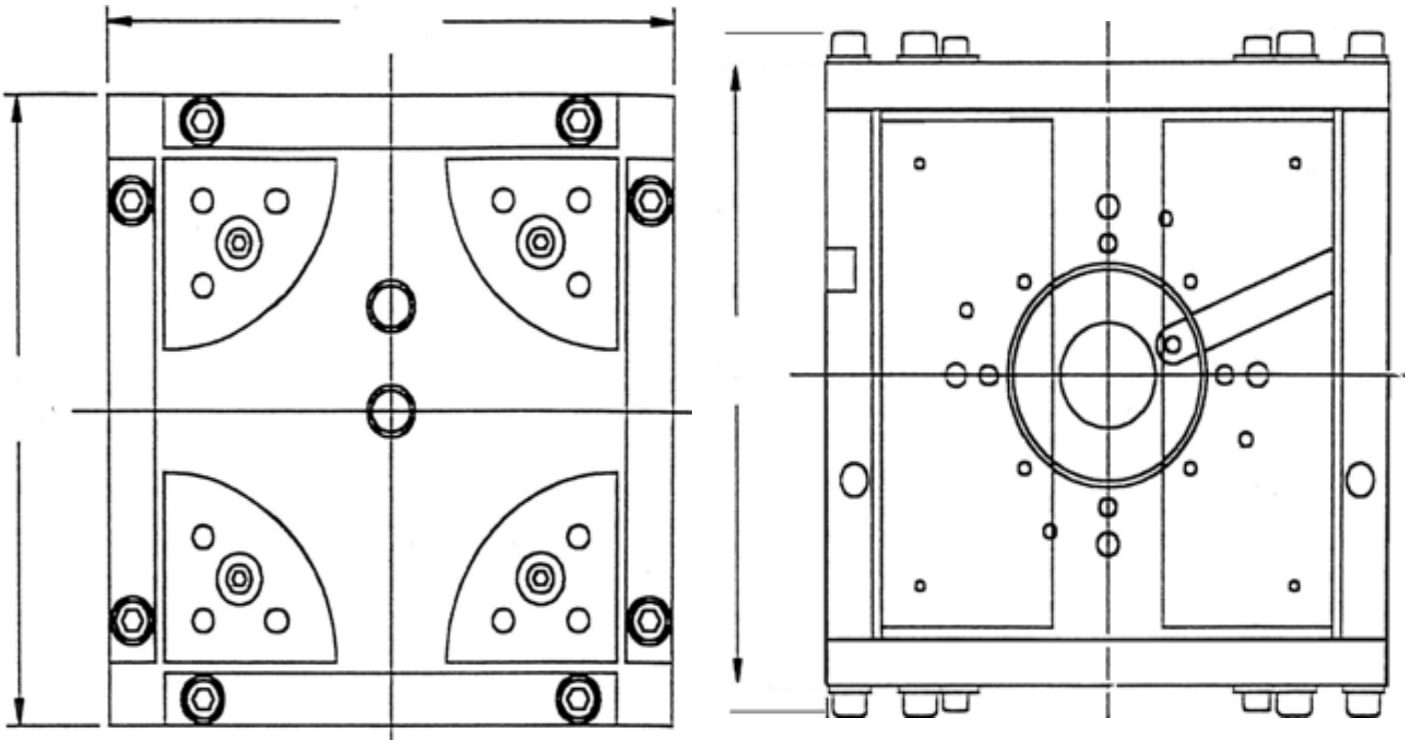
xxxxxx Hexapole ion guide mounted into vented housing for pressure reduction. Includes Entrance and Exit Lenses (high-transmission broad mass range ion guide)

Ion Deflectors and Ion Optics Components

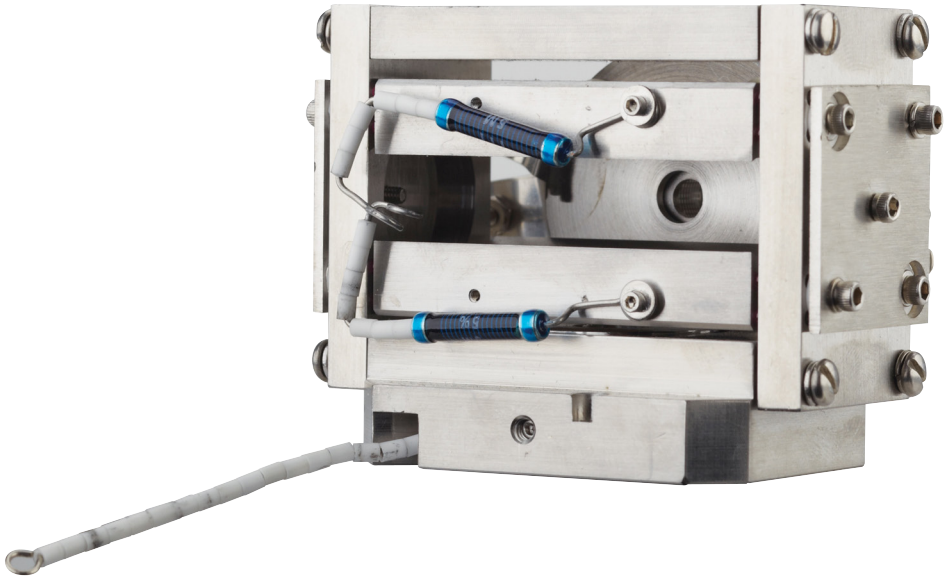
Ion Deflectors can be used to turn ions 90°. The compact deflector can be used to turn ions 90° in one direction from the entry axis, and the large deflector can be used to turn ions 90° in two directions from the entry axis. Both can be tuned to allow the ions to travel through the deflector along the entry axis. The ions will encounter a field-free region in this mode and lose focus.

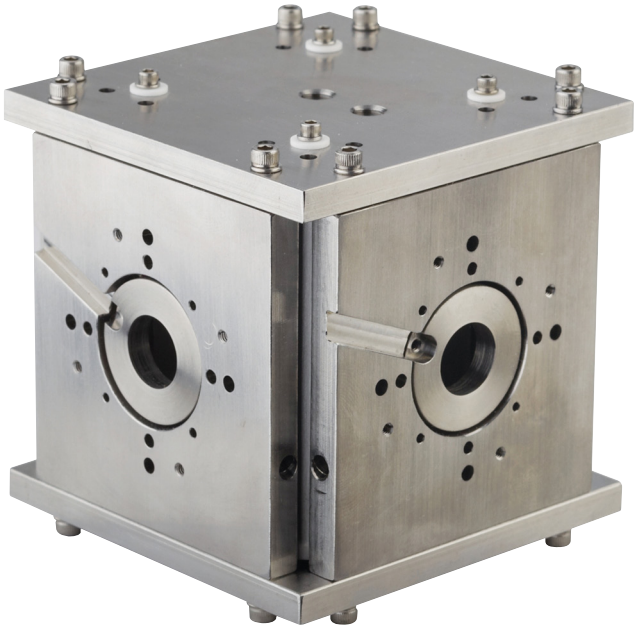
The Ion Deflector can also be used as energy filters and have 0.6 eV energy resolution. The deflectors and Einzel Lenses can be mounted to other Extrel components or can be used as component parts in other mass spectrometer systems. Power can be supplied from the Merlin Automation Series Controllers (page 38) using the Lens Power Supplies (pages 39). The customer can also supply the appropriate voltages from any stable DC power supply. For more information request Product Notes GP-111 and GP-160.

Part #	Description
811989	Quadrupole Deflector/Energy Filter. 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



Ion Deflector Dimensions In mm					
Type	Part Number	A	B	C	Minimum ID
Large 90°, 180°, 270°	811989	76.20	76.20	76.20	101
Small 90° only	814715	78.74	41.07	62.10	101





Quadrupole, Octupole, and Hexapole and MS/MS Accessories

Part # Description

252203 Quadrupole Entrance Lens Assembly for upgrading 9.5 mm ELFS plate

047101 Quadrupole Entrance Lens Assembly for upgrading 19 mm ELFS plate

U-2522 Quadrupole Exit Lens Assembly upgrade for 9.5 mm Quadrupole

265801 Quadrupole Exit Lens Assembly upgrade for 19 mm Quadrupole

xxxxxx Interstage Lens Assembly Duel Tube Lens for connecting any combination of 9.5 mm Quadrupoles, Octupoles or Hexapoles

xxxxxx Interstage Lens Assembly Duel Tube Lens for connecting two 19 mm Quadrupoles

812609 Isolated Centering Post. For centering 9.5 mm Quadrupole, Octupole and Hexapole into nominal 3.83-inch I.D. hole. Three required per device.

811811 Centering Post. For centering 9.5 mm Quadrupole Octupole and Hexapole into nominal 4.76-inch I.D. hole. Three required per device.

810128 Centering Post. For centering 9.5 mm Quadrupole, Octupole and Hexapole into nominal 5.76-inch I.D. hole. Three required per device.

812763 Isolated Centering Post. For centering 19 mm Quadrupole into nominal 3.76-inch I.D. hole. Three required per quadrupole.

611703 Centering Post. For centering 19 mm Quadrupole into nominal 4.01-inch I.D. hole. Three required per quadrupole.

611704 Centering Post. For centering 19 mm Quadrupole into a nominal 5,760-inch ID. Three required per quadrupole.

812801 Isolated Centering Post. For centering 19 mm Quadrupole into nominal 5.76-inch I.D. hole. Three required per quadrupole.

xxxxxx Isolation Kit for electrically isolating quadrupole mass filter housing for existing 6-inch flange system, 9.5 mm quadrupole, Octupole, and Hexapole. UHV Compatible. Replaces existing multiplier entrance plate and quadrupole exit lens insert. Requires customer supplied lens power supply.

814275 Isolation Kit for electrically isolating quadrupole mass filter housing for existing 8-inch flange system, 9.5 mm quadrupole, Octupole and Hexapole. UHV Compatible. Replaces existing multiplier entrance plate and quadrupole exit lens insert. Requires customer supplied lens power supply.

814507 Isolation Kit for electrically isolating quadrupole mass filter housing for existing 6-inch flange system, 19 mm quadrupole UHV compatible. Replaces existing multiplier entrance plate and quadrupole exit lens insert. Requires customer supplied lens power supply.

xxxxxx Isolation Kit for electrically isolating quadrupole mass filter housing for existing 8-inch flange system, 19 mm quadrupole. UHV compatible. Replaces existing multiplier entrance plate and quadrupole exit lens insert. Requires customer supplied lens power supply.

152203 TQMS Probe Kit, 8 lengths ceramic beaded nickel wire, 2 lengths ceramic beaded copper wire, and six copper RF rods.

Detectors

Detectors, Housings, Pre-Amps

Detectors, Detector Housings, and Pre-Amps

Extrel offers several detectors and configurations to meet the needs of customers. These include electron multipliers optimized for various applications, and their associated housings, flanges, and preamplifiers. When ordering components to be assembled by Extrel, please specify this requirement to your sales representative.

Electron Multiplier Detectors

Extrel recognizes the requirement for extremely low multiplier dark current (<3 cps for positive ion counting). In order to ensure that multipliers meet our demanding specifications, Extrel utilizes a proprietary cleaning procedure, and assembles pulse-counting multipliers using a specially designed low-noise conversion dynode.

Options include:

- **811681** Standard Analog electron multiplier which is best used for signals >0.1nAmps
- **810132** Standard Counting electron multiplier used for analog and counting modes with signals <0.1nAmps (1,000,000 counts per second)
- **812274** Low Noise, Pulse-Counting electron multiplier used for very low signals and is specially cleaned to have very low, dark current noise

Housings

Extrel's housings are available to shield the electron multiplier mounted on a 100 CF or 150 CF flange.

- **410301** Multiplier Housing Assembly for 100 CF or 150 CF (6 or 8-inch) flanges
- **812783** Isolated Multiplier Housing which isolates the multiplier housing from the mass filter housing
- **812323** In-situ non-flange mounted housing with five (5) each MHV connections
  Length: 98.48 mm (3.88 inches) Diameter: 69.22 mm (2.725 inches) for mounting multiplier inside a vacuum system where flange mounting is inconvenient.

Custom-length multiplier housing and special mounting solutions are also available.

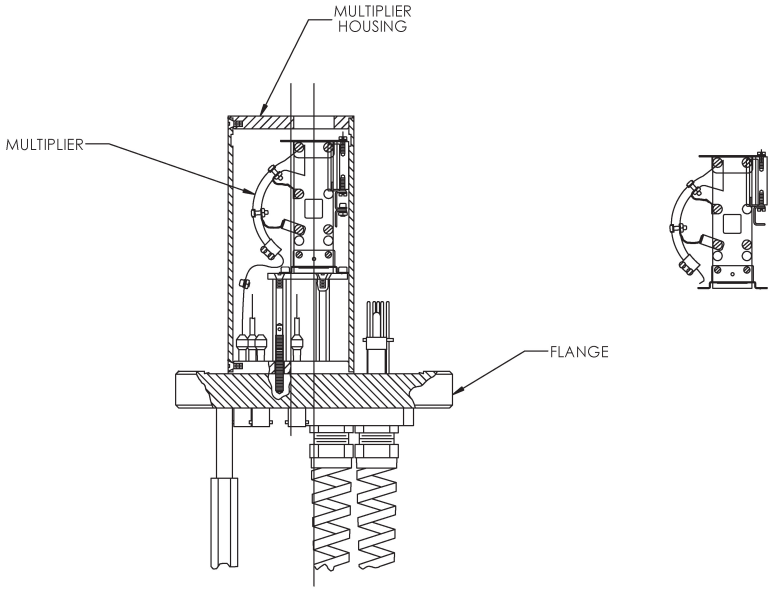


Figure 1:
Schematic of a multiplier housing

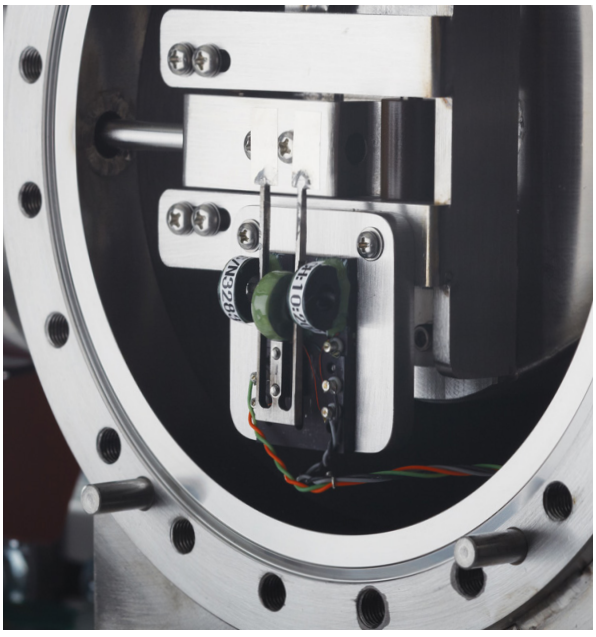
Pre-Amplifiers

Pre-amplifiers are available for analog and counting applications. Counting preamps are further available in positive ion only, or dual positive and negative ion detection. A lock-in amplifier allows the user to synchronize analog data collection with an external signal such as a chopper. (Note: use of the lock-in amplifer does not synchronize the MS scan rate, only the data acquisition.)

- **812554** ***Merlin Analog Preamplifier*** with Cable offering seven (7) gain resistors from 10^6 to 10^{12} Ohms

- **812558** ***Merlin Pulse-Counting Preamplifier*** with Cable for pulse counting positive ions only

- **817948** ***Merlin Pulse-Counting Negative Ion Option*** allows for collection of positive and negative ions. Includes internal preamp coupling capacitor and cables for connection to flange.



- **822093** ***Lock-in amplifier***, operates in conjunction with the 812554 Merlin Analog Preamp to allow the users to synchronize data set to the Merlin Automation Data System or other data acquisition system to an external system. The lock-in amplifier can be used with a chopper or other external pulse source. The lock-in ampifier can operate from 0.5 Hz to 100 kHz with a data collection window of 25 Sec at 1 Hz, 6 Sec at 10 Hz, 2 Sec at 10 kHz, with a trigger either as a sine wave of 100 mV minimum, 1 Vrms nominal or as a pulse of ±1 V, 1 µs minimum width. The lock-in amplifier can be operated where the data revealed to the acquistion system is the total signal during the acquisition window, or the signal difference between the two pulse states of the drive pulse. Please note that the lock-in amplifier does not modify the scan rate of the mass spectrometer, only the time when data is collected.

- **819719** ***Ion Beam Chopper*** for interrupting the incoming ion beam. Used with the lock-in amplifier to subtract background noise. Requires the Chopper Drive.

- **818729** ***Ion Beam Driver*** controls the chopper frequency and delivers the timing pulse.

Figure 2:
Ion Beam Chopper installed in a molecular beam mass spectrometer.

RF/DC and RF-Only Power Supplies

The 150-QC Power Supply is the high-precision, high-stability RF/DC and RF-only power supply for Extrel Quadrupole Mass Filters, Octupoles, and Hexapole Ion Guides. The selection chart below shows the available RF frequencies and the maximum mass for each of our quadrupole mass filters.

Mass range, sensitivity, abundance sensitivity, and resolution are determined by the quadrupole rod size and the RF operating frequency. Increasing the operating frequency or the quadrupole rod size increases the sensitivity, abundance sensitivity, resolution, and high-energy ion transmission and filtering. Decreasing the quadrupole rod size or the RF operating frequency increases the mass range.

The RF frequency of the 150-QC can be changed using the RF oscillators shown on pages 29 and 30. This allows you to modify your system for increased mass range or better performance as your requirements change.

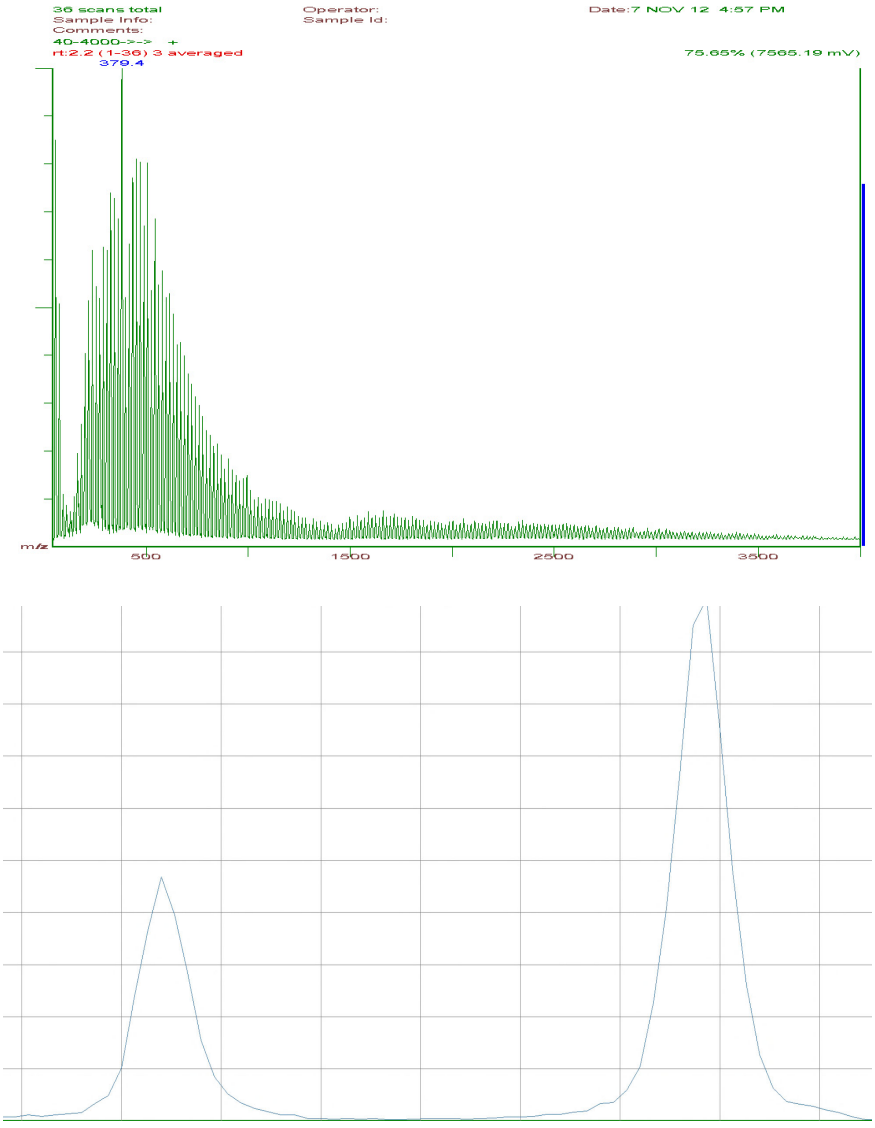
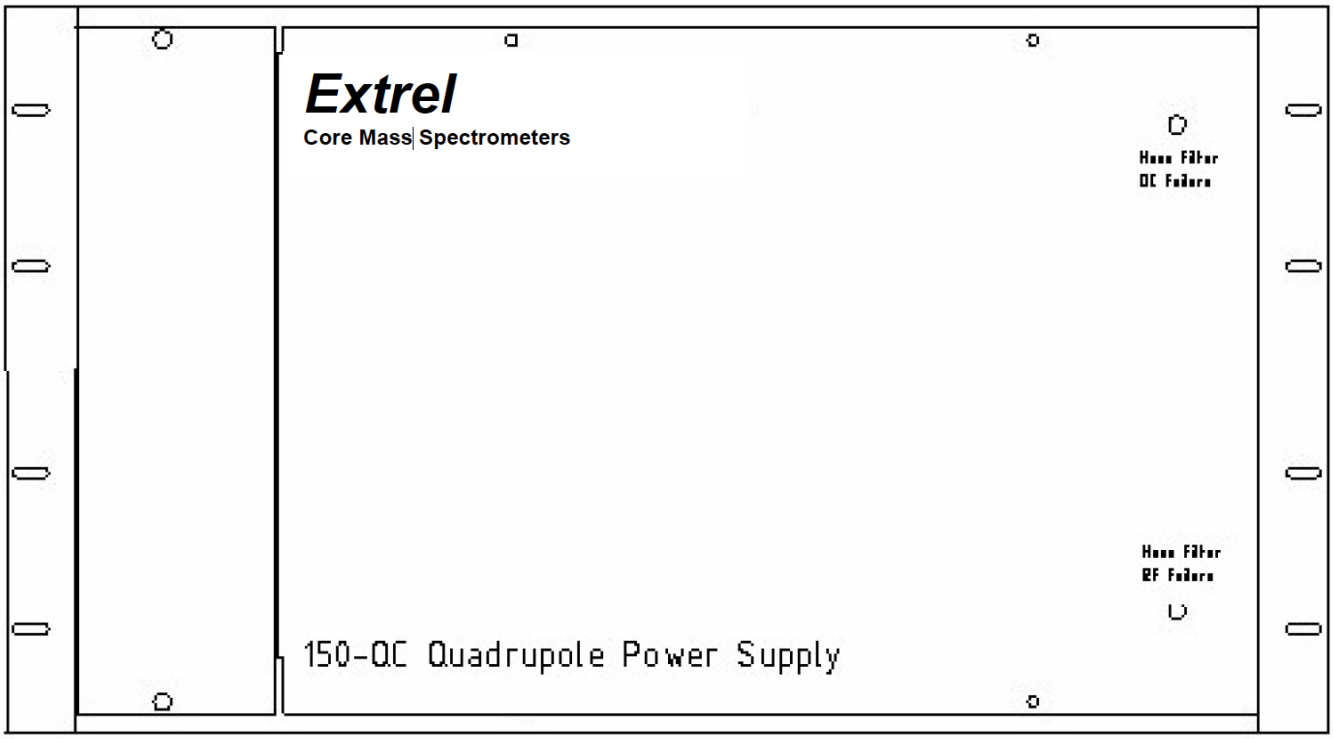
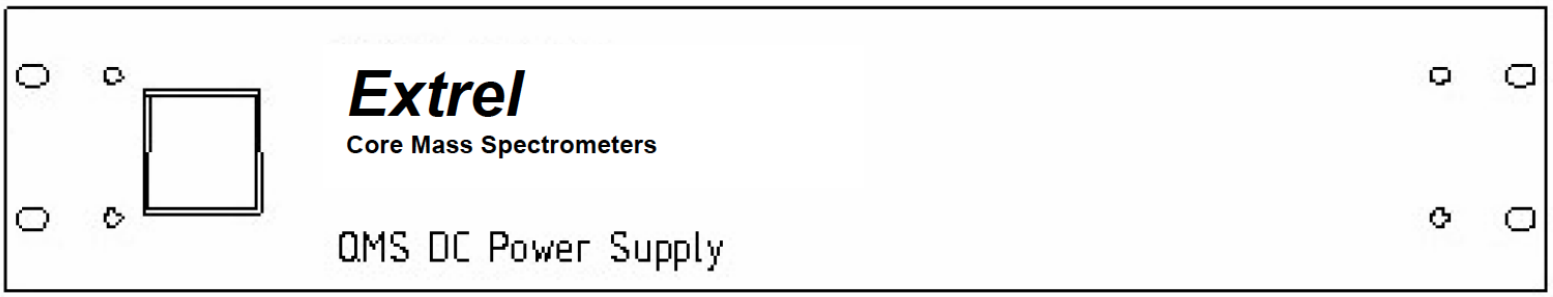


Figure 1: Extrel's RF/DC Supplies allow the researcher to look at a multitude of applications
Top: Clusters out to 4000 m/z
Right: Helium and Deuterium split at 4 m/z

150-QC Quadrupole Power Supply Selection Chart			
RF Frequency	Type	Maximum Mass Range for Extrel Quadrupoles	
440 kHz	RF/DC	16000	4000
880 kHz	RF/DC	4000	1000
880 kHz	RF Only	NA	NA
1.2 MHz	RF/DC	2000	500
1.2 MHz	RF Only	NA	NA
2.1 MHz	RF/DC	500	120
2.1 MHz	RF Only	NA	NA
2.9 MHz	RF/DC	200	60





QPS Quadrupole Power Supply

A QPS Configuration is based on the 150-QC Quadrupole Power Supply and provides all of the power supplies and cabling required to operate Extrel Quadrupole Mass Filters, Hexapole Collision Cells and Ion Guides and Octupole Ion Guides. Scanning and Mass Position are commanded by a stable 0-10 volt user-supplied inputs or by a Merlin Scan Controller (see page 38). The QPS system also supplies a Pole Bias voltage to adjust the centerline potential of the quadrupole.

The components and options of the QPS systems are also listed separately on pages 27, 28 and 29.

For More information on the RF/DC and RF-only power supplies ask for Product Note RP_2201.

Quadrupole Power Supply Dimensions in mm						
	Height	Width	Depth	Behind Supply	Above Supply	Below Supply
150-QC	267	483	508	300	77	77
QMS DC Supply	89	483	356	300	77	77

QPS Options		
Item	Standard	Options
Quadrupole Power Supplies	150-QC RF Power Supply	Multiple 150-QCs for MS/MS Operation
	Mass Command Board	NA
	1.5 m / 5 ft. RF Cables	Special lengths note: Changes mass range
	(1) Fixed Frequency Oscillator	Additional oscillators for changing mass ranges and performances
	200 VDC Pole bias power supply	Mass Command Board will (3) DC Power Supplies for use with RF-only
	QMS DC Supply	High power or low power depending on the mass range required.
	RF/DC and RF-only Operation	RF-only

QPS Configurations for 9.5 mm Quadrupoles

Part #	Description
	QPS-260, 1-250 amu, 2.9 MHz 150-QC, for 9.5 mm quadrupole
812995	300 Watt QC, 2.9 MHz Quadrupole Power Supply for 9.5 mm quadrupoles
xxxxxx	QC-260 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-500b, 2-500 amu, 2.1 MHz 150-QC, for 9.5 mm quadrupole
U-1438	300 Watt QC, 2.1 MHz Quadrupole Power Supply
813309	QC-500b modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-2000, 2-2000 amu, 1.2 MHz 150-QC, for 9.5 mm quadrupole
U-72	300 Watt QC, 1.2 MHz Quadrupole Power Supply
	QC-2000 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-4000, 4-4000 amu, 0.88 MHz 150-QC, for 9.5 mm quadrupole
371201	300 Watt QC, 0.88 MHz Quadrupole Power Supply
813420	QC-4000 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power

QPS Configurations for 19 mm Quadrupoles

Part #	Description
	QPS-60, 1-60 amu, 2.9 MHz 150-QC, for 19 mm quadrupole
697303	300 Watt QC, 2.9 MHz Quadrupole Power Supply for 19 mm quadrupoles
813592	QC-60 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-120, 1-120 amu, 2.1 MHz 150-QC, for 19 mm quadrupole
U-1438	300 Watt QC, 2.1 MHz Quadrupole Power Supply
xxxxx	QC-120 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-500, 2-500 amu, 1.2 MHz 150-QC, for 19 mm quadrupole
U-72	300 Watt QC, 1.2 MHz Quadrupole Power Supply
813309	QC-500 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QC-2000 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power
	QPS-1000, 2-1000 amu, 0.88 MHz 150-QC, for 19 mm quadrupole
371201	300 Watt QC, 0.88 MHz Quadrupole Power Supply
813515	QC-1000 modification kit
813419	150-QC Cable Kit
813370	QMS DC Supply, High Power

QPS RF-Only Power Supply for Quadrupoles, Octupoles, and Hexapoles

These power supplies are commonly used to provide the voltage for RF-only quadrupole, hexapole or octupole collision cells or ion guides. The Power Supply includes an additional Lens Power Supply Board that will supply DC voltages for the Entrance and Exit Lenses and Pole Bias.

QPS RF-only Power Supply for Quadrupoles, Octupoles, and Hexapoles

Part #	Description
	RFQPS 2.1 for use with Octupoles and Hexapoles, 2.1 MHz 150-QC RF only Power Supply. Includes the following:
815235	200 Watt QC, 2.1 MHz Quadrupole Power Supply.
813692	RFQC-9000 modification kit.
813370	QMS DC supply, High Power
	RFQPS 2.1 for use with Octupoles and Hexapoles, 2.1 MHz 150-QC RF only Power Supply. With Optional Lens Supply Upgrade includes the following:
815017	200 Watt QC, 2.1 MHz Quadrupole Power Supply.
813692	RFQC-9000 modification kit.
813370	QMS DC supply, High Power
610602	Optional Lens Supply Upgrade for RF-only 150-QC Provides three DC power supplies for Entrance and Exit Lenses and Pole Bias Note: cannot be used with Standard RF/DC 150-QCs
610602	Optional Lens Supply Upgrade for RF-only 150-QC Provides three DC power supplies for Entrance and Exit Lenses and Pole Bias Note: cannot be used with Standard RF/DC 150-QCs

Oscillators for Changing 150-QC Frequncy and System Mass Range

Substituting a different RF Oscillator and mass command board can change the Mass Range and performance of the 150-QC RF/DC Power Supply. This allows the user to modify an existing system for new or expanded applications easily. Please see the chart on page 25 for chart showing the Mass Range and frequency comparisons.

Part #	Description
	OSC-20: Spare 2. MHz oscillator for 9.5 mm quadrupole.
xxxxxx	300 watt 2. MHz oscillator for use with 150-QC.
U-391	Spare mass command board
	OSC-2000: Spare 1.2 MHz oscillator for 9.5 mm quadrupole.
134903	300 watt 1.2 MHz oscillator for use with 150-QC.
U-391	Spare mass command board.
	QC-2000 modification kit

	OSC-4000: Spare 0.88 MHz oscillator for 9.5 mm quadrupole
815046	300 Watt 0.88 MHz oscillator for use with 150-QC
U-391	Spare mass command board
813420	QC-4000 modification kit
	OSC-60: Spare 2.9 MHz oscillator for 19 mm quadrupole
813080	300 watt 2.9 MHz oscillator for use with 150-QC
U-391	Spare mass command board
813592	QC-60 modification kit
	OSC-120: Spare 2.1 MHz oscillator for 19 mm quadrupole
814570	300 watt 2.1 MHz oscillator for use with 150-QC
U-391	Spare mass command board
814728	QC-120 modification kit
	OSC-500: Spare 1.2 MHz oscillator for 19 mm quadrupole
134903	300 watt 1.2 MHz oscillator for use with 150-QC
U-391	Spare mass command board
813309	QC-500 modification kit
	OSC-1000: Spare 0.88 MHz oscillator for 19 mm quadrupole
815046	300 Watt 0.88 MHz oscillator for use with 150-QC
U-391	Spare mass command board
813515	QC-1000 modification kit

QMS DC Power Supplies and Accessories for 150-QC

QMS DC Supplies are required for operation of 150-QC Power Supplies. To achieve the maximum mass range for any given RF frequency you will need the High Power Version of the QMS DC Supply.

Part #	Description
813369	QMS DC Supply, Low Power.
813370	QMS DC Supply, High Power. Provides maximum DC power to drive a 150-QC and quadrupole combination to their maximum Mass Range
813532	Interlock Cable for use when two or more QMS DC Supplies are used in the same system
813419	150-QC Cable Kit. For use when a 150-QC is purchased without a Merlin DC cable to low amu supply, phono connector for custom mass command cable, and 15 pin D-connector for custom resolution control cable
C-311	Replacement 200/300 watt pole DC board
U-391	Spare mass command board. Required when a second oscillator is used to change mass range

External Linearizers for Extended Mass Range 150-QC

Mass calibration on extended mass range systems require either computer controlled mass calibration (i.e. Merlin Automation Data System Controller), or, for analog mass command control, an additional linearizer circuit to help linearize the mass calibration to make the mass calibration is accurate at high mass.

Part #	Description
812719	1200/2000 amu external linearizer: for use with analog controlled systems only, not needed with Merlin
812748	4000 amu external linearizer: for use with analog controlled systems only, not needed with Merlin
813373	9000 amu external linearizer: for use with analog controlled systems only, not needed with Merlin

Multiple Quadrupole Upgrades for 150-QC RF/DC Power Supplies

Whenever multiple quadrupoles are used in the same system, the quadrupole power supplies should be modified to allow a single frequency source to drive all of the power supplies for maximum sensitivity.

Part #	Description
254604	Remote 0.88 MHz synchronizing oscillator for matching frequencies in multiple quadrupole systems
254602	Remote 1.2 MHz synchronizing oscillator for matching frequencies in multiple quadrupole systems
254603	Remote 2.1 MHz synchronizing oscillator for matching frequencies in multiple quadrupole systems

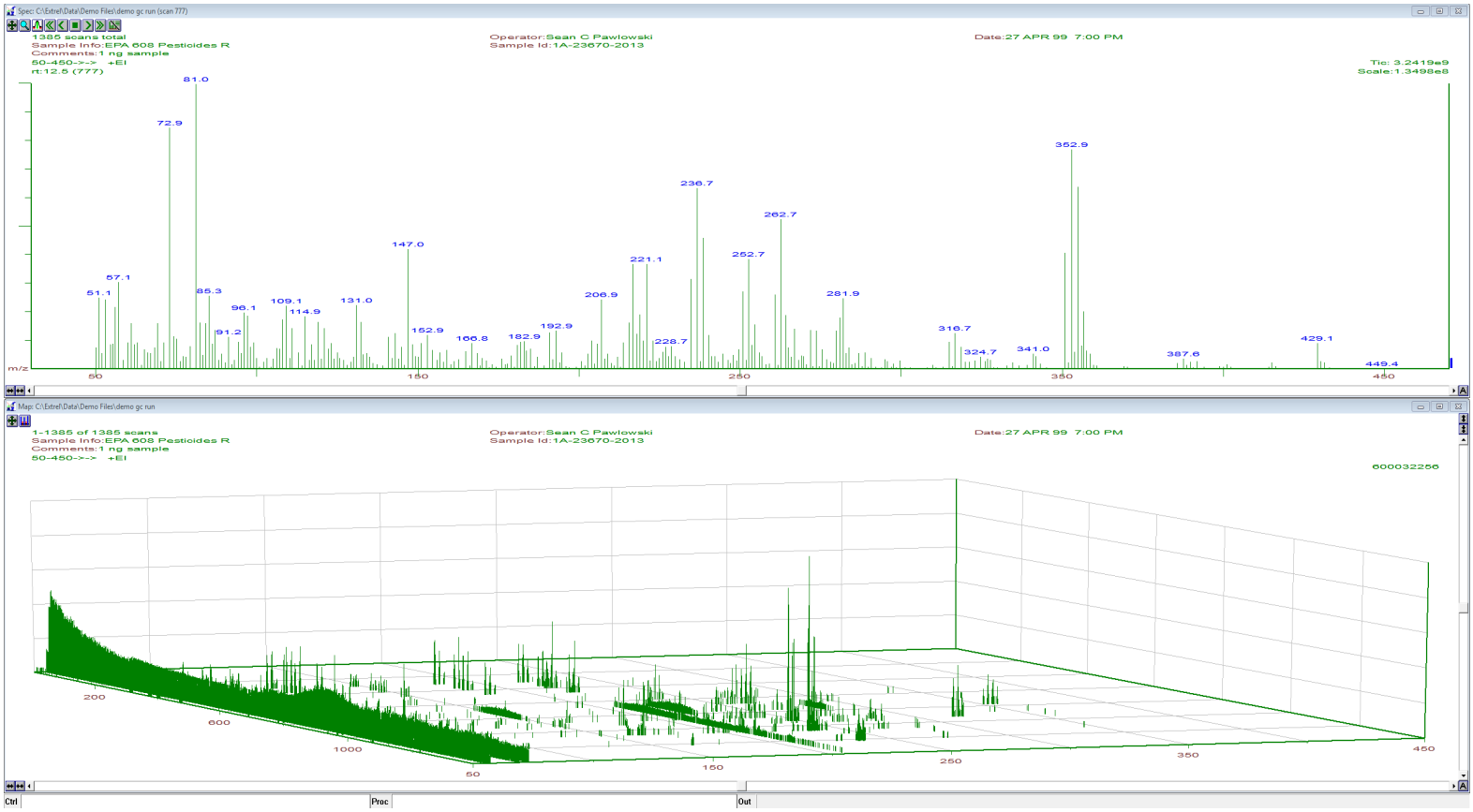
Extrel

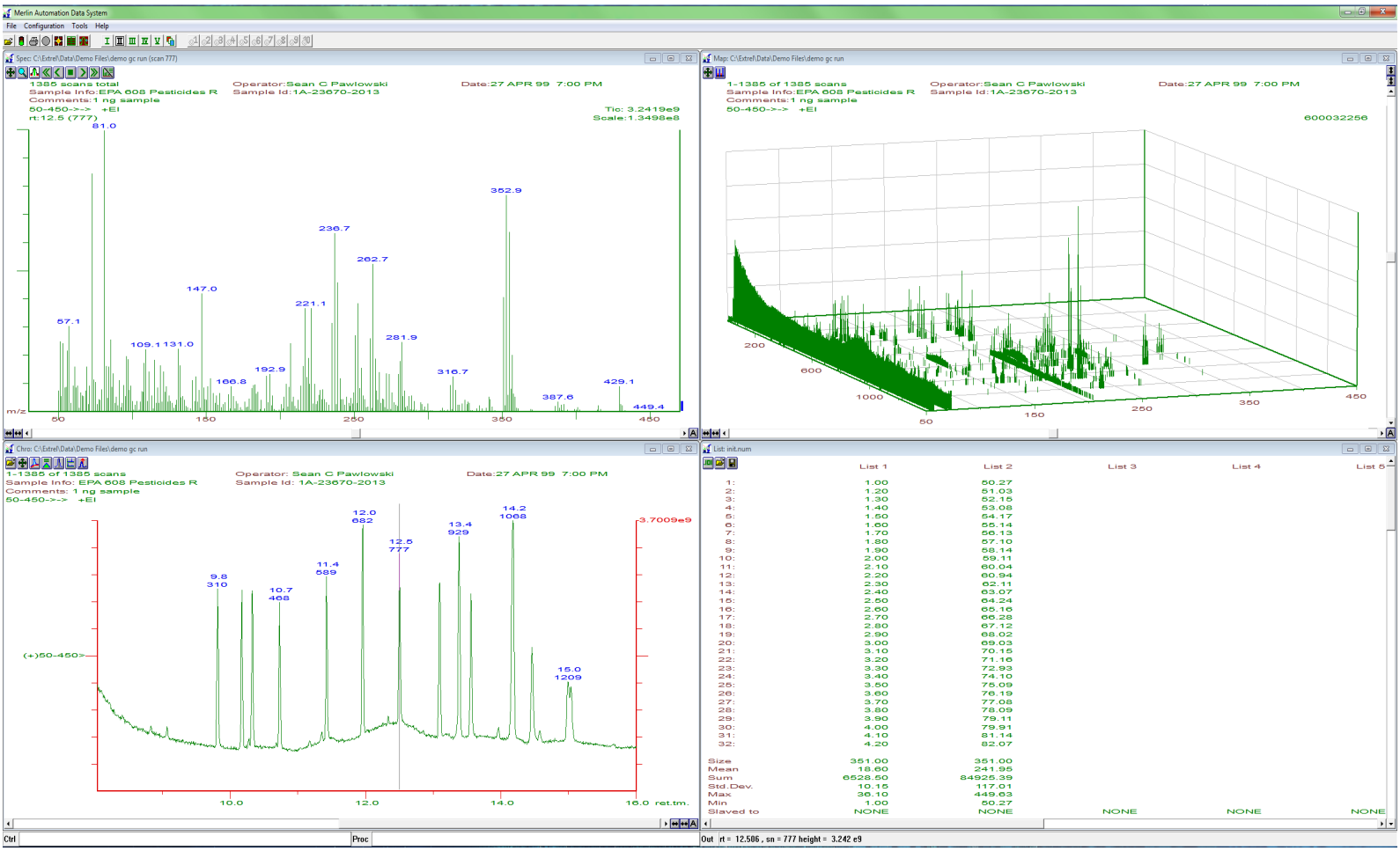
Software and Controllers

Software and Controllers

The Merlin Automation Data System Software is a true analytical software package designed not only for high precision control and operation of a mass spectrometer, but also to be a powerful data manipulation and presentation tool.

In addition to the standard software package, Extrel also offers application-specific software modules. Please contact your local Extrel representative for a complete list of the latest available software modules.





Merlin Automation Data System Software

The Merlin Automation Data System software features include:

- Merlin Automation Windows XP and 7 versions
- System configuration editor
- Hardware monitoring and control
- Any combination of 20 Mass Ranges and/or SIM Masses Standard, specifically with a user-written Macro
- Chromatography Background Subtract and Library Search (Library not included)
- Acquire and plot external analog voltages against mass data
- High-speed data reduction
- Mass Data display in 2-D and 3-D
- Application-specific software customization with easy-to-use macro language
- True MS/MS Software

Questor 5 Process Analysis Software

Questor 5 Process Analysis Software is a true process analysis software package for use with the MAX300-LG and MAX300-IG Gas Analysis Systems. It is a powerful tool that allows the user to monitor an unlimited number of stream components, have full control of the mass spectrometer, and control heaters and multiport valves.

Questor 5 Software features include:

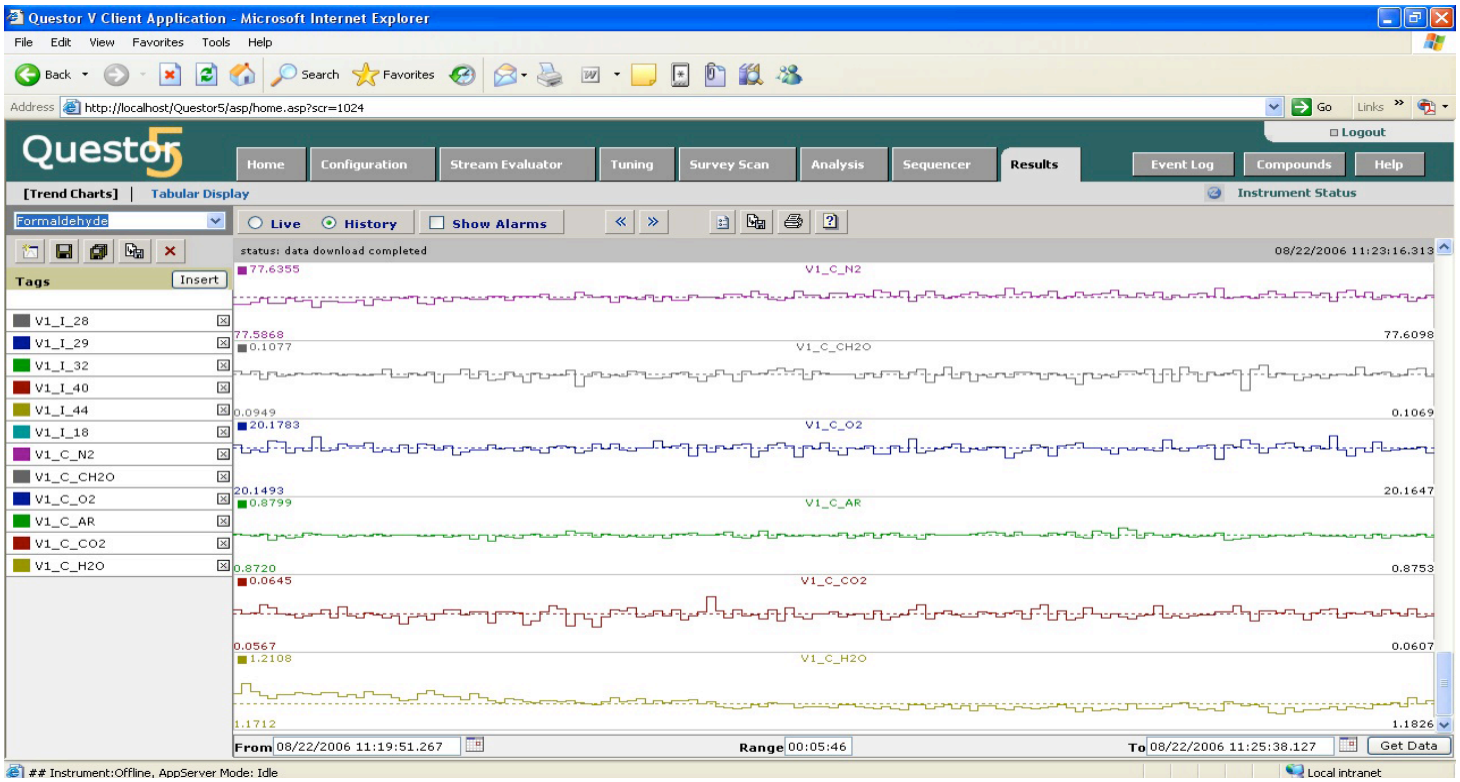
- Merlin Automation Windows XP and 7 versions
- System configuration editor
- Hardware monitoring and control
- Unlimited number of Mass Ranges or SIM Masses
- SIM, Spectra and Trend Analysis
- Process methods
- High-speed data reduction
- Web and modem remote connections

Ordering Information

Merlin Automation Workstation Upgrade for 5221 Series Controller for Windows XP or 7 (Required to convert user's computer to Merlin Automation Workstation). Minimum requirements: Pentium IV or faster processor, 512 Mb RAM, >2 Gb HD, One available full sized USB or Ethernet Port, CD ROM, one available Hardware IRQ, and Windows 7 or XP Operating System. Includes software license, Merlin Automation Manual, and Windows 7/XP version of Merlin Automation software on a CD-ROM disc.

Questor 5 Workstation Upgrade for MAX300-LG and MAX300-IG Process Analysis for Windows 7 or XP (Required to convert user's computer to Merlin Automation Workstation). Minimum requirements: Pentium IV or faster processor, 512 Mb RAM, >4 Gb HD, One available full sized USB or Ethernet port, CD ROM, one available Hardware IRQ, and Windows 7 or XP Operating System. Includes software license, Merlin Automation Manual, and Windows 7/XP version of Merlin Automation software on a CD-ROM disc.

Merlin Automation 3.0 Version Upgrade Package for 0.94 to 2.07 Versions



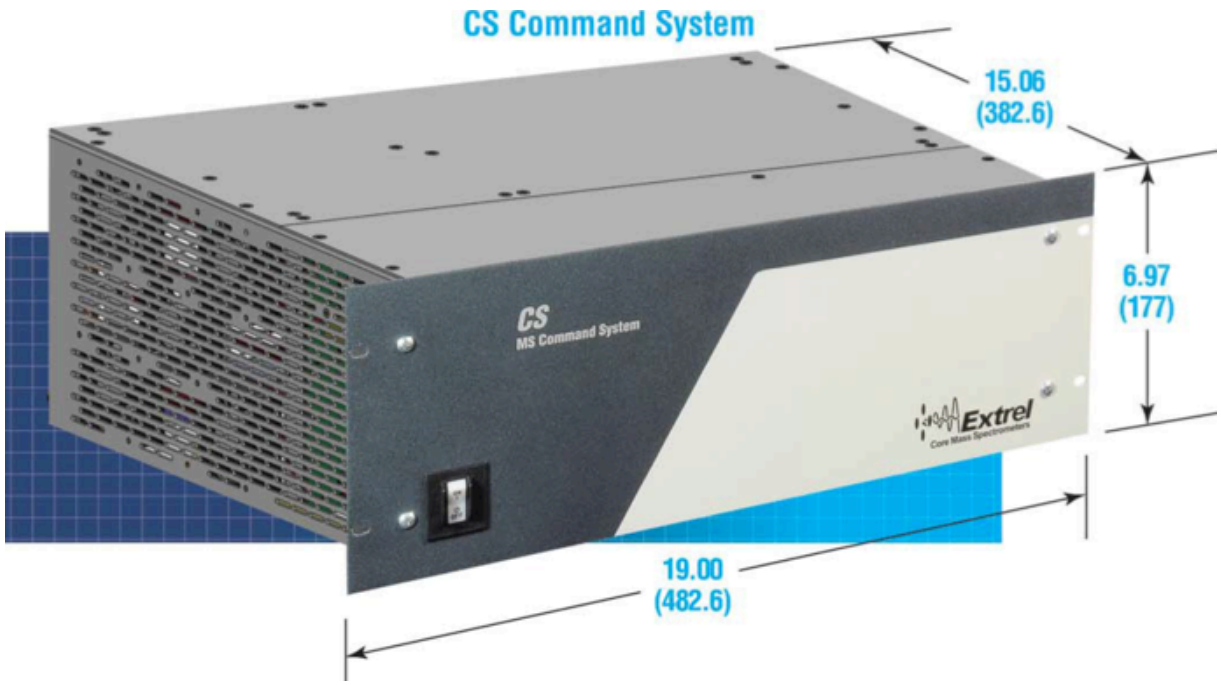
Merlin Automation Data System Controllers

Extrel offers two different Controller Packages using the powerful Merlin Automation Data System Software. They both have the flexibility to change and grow with the customer's requirements.

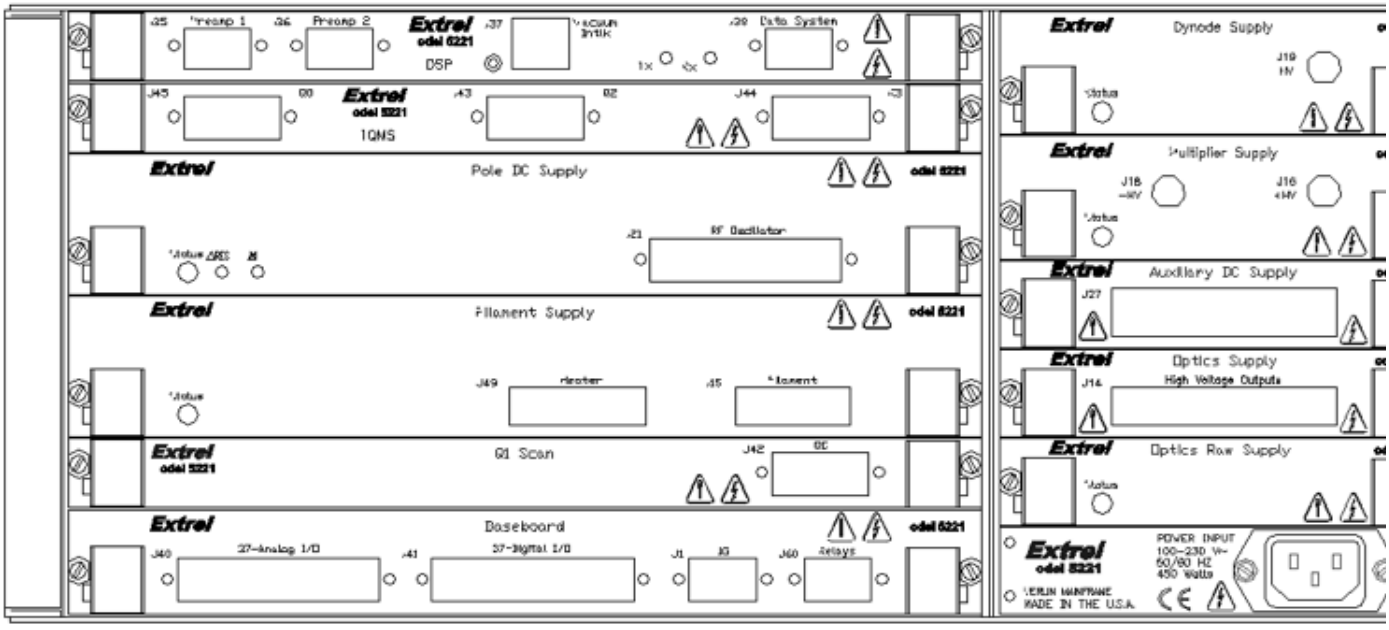
The MAX CS Controller is a full Quadrupole Mass Spectrometer control system that comes complete with software and control modules for quadrupole operation, the power supplies required to power filaments, ion optics and an electron multiplier detector, and a choice of either an analog or pulse-counting preamplifier. The modular design allows the customer to add the power supplies, control modules, and specialized software modules that best suits the application.

The Extrel 5221 Scan Controller is the same as the MAX CS Controller but without the Control and Power Modules. It is a scan-and-resolution controller that can be upgraded to control other mass spectrometer components.

The Controllers are 19-inch Rack Mountable and work at 110/220 volts and 50/60 Hertz.



5221 Controller Options		
Module	**Standard**	**Options**
	Control Modules	
Scan Module	(1) Scan Module	NA
Base Board	(6) Analyog in parallel ports	Analog expansion Board with 20 additional analog I/O ports
	(8) Analog in parallel ports	
	(5) Analog I/O serial ports	
	(16) Digital I/O ports	
	(8) Digital in	
	(8) Digial out	
	(3) Relay connections	
	(1) Ion Gauge Connection	
DSP Module	(1)DSP Module	NA
Optics Raw Supply	(1) Optics Raw Supply	NA
TQMS Module	None	TQMS Module for Multiple Quad Operation
Power Modules		
Filament Module	(1) Filament Module	None
	3 m/10 ft cable	Custom-length cable
Optics Module	(1) Optics Module	None
		(2) Optics Modules
	(2) +/- 100 VDC Len Boards	0 to 4
	(6) +/- 100 VDC Len Boards	0 to 16
Dynode Module	(1) Dynode Module	None
		(2) Dynode Module
	3 m/10 ft cable	Custom-length cable
Multiplier Module	(1) Multiplier Module	None
	3 m/10 ft	Custom-length cable
Optics Cable	(8) Lens Board Connections	(2) Filaments 2 (7) Lens Connections
	(1) Filament Connection	No Filament w (8) Lens Connections



Controller Dimensions in mm						
	Height	**Width**	**Depth**	**Behind Controller**	**Above Controller**	**Below Controller**
5221 Series	177	483	420	77	35	35

Merlin Automation Data System Controllers 5221 Series

Part #	Description
816296	Merlin Automation Data System Quadrupole Mass Spectrometer Controller with 5221 series Mainframe, Control Modules (DSP and Scan), Power Modules (Filament, Optics with 6 Optics Power Supplies, Dynode and Multiplier), Preamplifier (Analog or Pulse Counting), MADS Software, PCI interface card and Analog and Digital I/O ports, Relay Connections, and Ion Gauge. User-supplied Windows 2000 or XP PC required.
816297	Merlin Automation Data System Quadrupole Mass Spectrometer Controller with 5221 series Mainframe, Control Modules (DSP and Scan), Power Modules (Filament, Optics with 8 Optics Power Supplies, Dynode and Multiplier), Preamplifier (Analog or Pulse Counting), MADS Software, PCI interface card and Analog and Digital I/O ports, Relay Connections, and Ion Gauge. User-supplied Windows 2000 or XP PC required.
816295	Merlin Automation 5221 Series Scan and Resolution Controller with 5221 series Mainframe, Control Modules (DSP and Scan), Preamplifier (Analog or Pulse Counting), MADS Software, PCI interface card and Analog and Digital I/O ports, Relay Connections and Ion Gauge. Controller has open slots for additional Control and Power Modules. User-supplied Windows 2000 or XP PC is required.

Optic Cables for All Components

Optics Cables are required to connect the Optics Power Module to the Quadrupole Probe Assembly.

Part #	Description
813464	***Merlin Optics Cable, Standard Configuration*** Connections for up to eight Lens Daughter Boards and Single Filament, 10 feet.
813415	***Merlin Optics Cable, Biased Quadrupole Housing Configuration*** Connections for up to eight Lens Daughter Boards and no Filaments. MHV connection from Optics element 7, 10 feet
813978	***Merlin Optics Cable, Biased Quadrupole Housing Configuration*** Connections for up to eight Lens Daughter Boards and Single Filament. MHV connection from Optics element 7, 10 feet.
813007	***Merlin Optics Cable*** Connections for seven Lens Daughter Boards and two Switchable Filaments, 10 feet.
813513	***Merlin Optics Cable*** for use with 8 Optics Lens Daughter Boards, with no Filaments, 10 feet.

5221 Series Controller Options

The following Power and Control Modules are for use with the 5221 series controllers only.

Part #	Description
816038	Additional Optics Module with Two (2) 100 VDC Lens Power Supplies and Four (4) 400 VDC Lens Power Supplies
816039	Additional Optics Module with Two (2) 100 VDC Lens Power Supplies and Six (6) 400 VDC Lens Power Supplies
xxxxxx	Additional Optics Module with other combinations of 100 VDC and /or 400 VDC Lens Power Supplies Up to eight (8) supplies
815367	Optics Raw Supply required to use Optics Modules with 5221 This is included in Scan Controller.
815494	Filament Supply Module (5221)
815535	Bipolar Conversion Dynode Power Module (5221)
815730	Bipolar Multiplier Supply Module (5221)
815082	Analog I/O Board: adds an additional twenty (20) Analog I/O ports for input and control
814579	Merlin Automation TQMS Control Module Quadrupole control software and hardware module with connections for synchronous control of up to three additional quadrupole power supplies (16 bit DAC commands for mass, resolution and pole bias, 12 bit command for resolution at high mass, plus digital controls for pole reverse, and resolving DC enable). Requires MS-Scan control module for control of primary quadrupole. Includes TQMS control module and three quadrupole power supply command cables

Specialized Control Cables

Part #	Description
814695	Merlin Automation computer cable 30-meter length

Power Modules for 5500 Series Controllers

The following components can be integrated into any 5500 series mainframe. The 5500 Series mainframes can accept up to five (5) of these modules. The 5500 mainframes can accept two Optics Power Supply Modules with a total of up to sixteen Lens Daughter Boards.

Note: The stock on these modules is very limited.

Part #	Description
811115	Filament Power Supply Module, 50 Watts: 10 VDC @ 5 amps or 5 VDC @ 10 amps with +/-200 VDC filament bias supply
811114	Optics Power Supply Module for Merlin 5500 Mainframe. Accepts a maximum of 8 lens daughter boards per module +/-400 VDC or +/- 100 VDC. 5500 Series Mainframe can accept two (2) Optics Power Supplies
811258	Lens Daughter Board for Optics Power Supply Module, +/-100 VDC
811113	Lens Daughter Board for Optics Power Supply Module, +/-400 VDC
811119	Bipolar Conversion Dynode Power Supply Module
811290	Bipolar Electron Multiplier Power Supply Module

Flanges and Mounting Options

Extrel's flanges and mounting components provide the customer with many options to solve simple or complex mounting problems.

Extrel offers a range of options: from flanges for mounting a complete mass spectrometer probe or components, to double-sided flanges for ease-of-mounting components in line with other system components. These flanges include port or feed-throughs for electrical connections. Feed-throughs, connection flanges, and customized flanges and mounting components are also available. Please tell your sales representative of any special requirements you may have.

Figure 1:

Skimmer Flange

From spacers to custom mounts, Extrel can help with any need you have.

Probe Flanges

- **655901** 100 CF (6 inch) UHV mounting flange includes an axial view port, on a 34 mm (1.33 inch) mini CF flange, one 10-pin connector on a 34 mm (1.33 inch) mini CF suitable for electrostatic lens connections up to 700V DC, five MHV connections for detector connections, one pair RF feed-throughs suitable for Extrel RF connections and one blank 34 mm (1.33 inch) mini CF flange. Removable handles are included for installation.

- **814258** 160 CF (8 inch) UHV mounting flange includes an axial view port, on 34 mm (1.33 inch) mini CF flange, one 10-pin connector on a 34 mm (1.33 inch) mini CF suitable for electrostatic lens connections up to 700V DC, five MHV connections for detector connections, one pair RF lens connections up to 700V DC, five MHV connections for detector connections, one pair RF feed-throughs sutiable for Extrel RF connections and one bland 34 mm (1.33 inch) mini CF flange. Removable handles are included for installation.

- **812263** 8-inch ISO mounting flange includes an axial view port, on a 34 mm (1.33 inch) mini CF flange, one 10-in connector on a 34 mm (1.33 inch) mini CF suitable for electrostatic lens connections up to 700V DC, five MHV connections for a detector connection, one pair RF feed-throughs suitable for Extrel RF connections, and one blank 34 mm (1.33 inch) mini CF flange. Removable handles are included for installation.

- **818762** 160 CF (8 inch) UHV-mounting flange includes an axial view port, on a 34 mm (1.33 inch) mini CF flange, two 10-pin connectors on a 34 mm (1.33 inch) mini CF suitable for electrostatic lens connections up to 700V DC, five MHV connections for detector connections,and three pair RF feed-throughs suitable for Extrel RF connections (available for two mass filters, and one collision cell RF device). Ports for collision cell pressure measurement and collision cell target gas are located radially. Removable handles are included for installation.

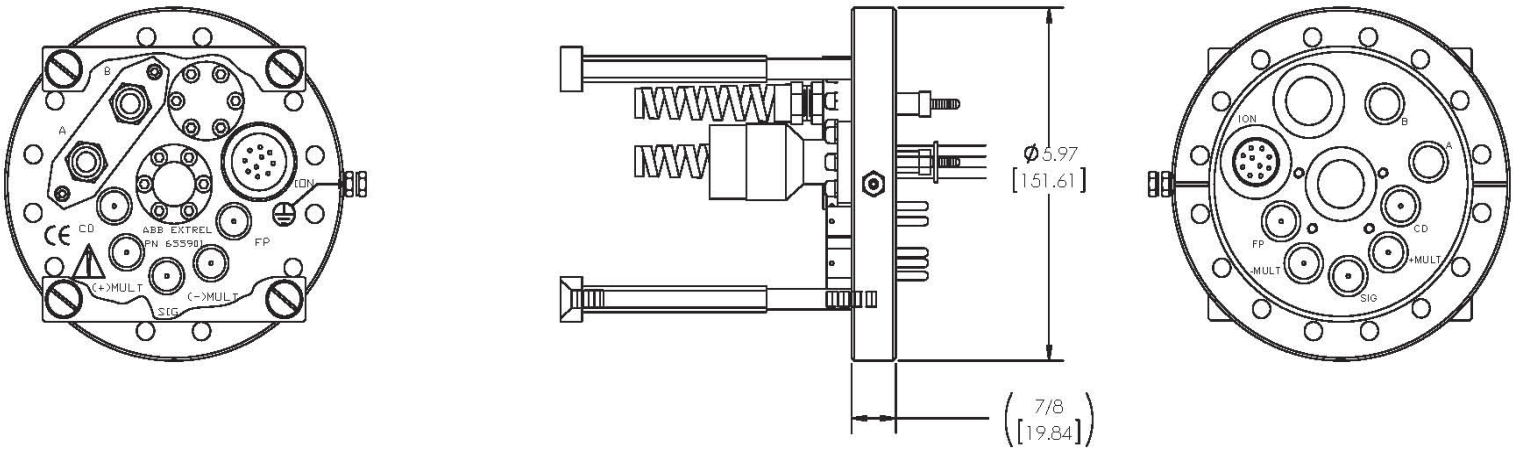


Figure 2:
Typical Probe Flange

Double-Sided Flanges with Radial Connections

- **819703** ***160 CF double-sided flange consists of two flange faces with a short chamber piece in which flanges are mounted radially***. A solid partition separates the two sides. The radial flanges are one 70 mm (2.75 inch) CF flange, and two 34 mm (1.33 inch) mini CF flanges. Customer must additionally select feed-through flanges to meet his or her requirements. Extrel part number 813478 is used for RF connections, and Extrel part number 330901 provides a 10-pin connector on a mini CF flange. If connections are needed on both sides, customer feed-throughs can be added.

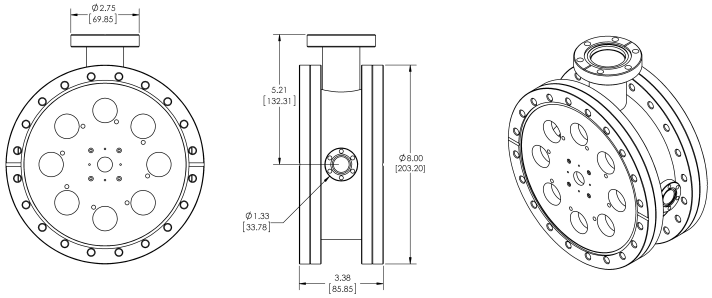


Figure 3:
Double-sided vented flange with radial connections for mounting components.

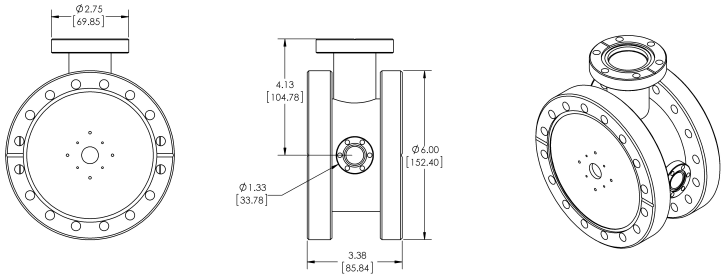


Figure 4:
Double-sided solid flange with radial connections for mounting components.

- **819704** ***160 CF double-sided flange, vented, consists of two flange faces with a short chamber piece in which flanges are mounted radially.*** A vented partition separates the two sides. The radial flanges are one 70 mm (2.75 inch) CF flange, and two 34 mm (1.33 inch) mini CF flanges. Customer must additionally select feed-through flanges to meet his or her requirements. Extrel part number 813478 is used for RF connections, and Extrel part number 330901 provides a 10-pin connector on a mini CF flange. If connections are needed on both sides, custom feed-throughs can be added.

- **819705** ***100 CF double-sided flange consists of two flange faces with a short chamber piece in which flanges are mounted radially.*** A solid partition separates the two sides. The radial flanges are one 70 mm (2.75 inch) CF flange, and two 34 mm (1.33 inch) mini CF flanges. Customer must additionally select feed-through flanges to meet his or her requirements. Extrel part number 813478 is used for RF connections, and Extrel part number 330901 provides a 10-pin connector on a mini CF flange. If connections are needed on both sides, customer feed-throughs can be added.

- **819706** ***100 CF double-sided flange, vented, consists of two flange faces with a short chamber piece in which flanges are mounted radially.*** A vented partition separates the two sides. The radial flanges are one 70 mm (2.75 inch) CF flange, and two 34 mm (1.33 inch) mini CF flanges. Customer must additionally select feed-through flanges to meet his or her requirements. Extrel part number 813478 is used for RF connections, and Exter part number 330901 provides a 10-pin connector on a mini CF flange. If connections are needed on both sides, customer feed-throughs can be added.

Other Flanges, Connectors, and Gate Valves

- **330901** 10-pin connector on a 34 mm (1.33 inch) mini CF flange. Suitable for electrostatic lens connections up to 700V DC
- **813478** 70 mm (2.75 inch) CF flange with one pair of RF connections. Includes strain relief
- **810998** Weldable RF cable end seals (feed-through) to integrate RF connections into custom flanges which need to mate with Extrel 150-QC or QCi Quadrupole Controllers. (2 required per system)
- **819477** 160 CF (8 inch) Gate Valve with Integrated Optics Specially designed gate valve for UHV applications. When fully opened, the center aperture of the gate valve is a controllable lens greatly reducing ion loss through the gate

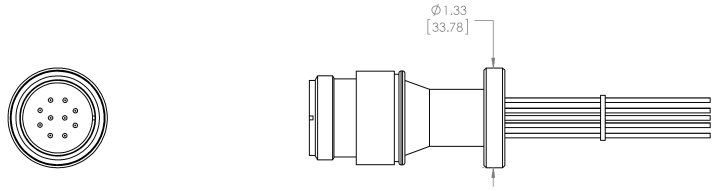


Figure 5:
10-pin connector

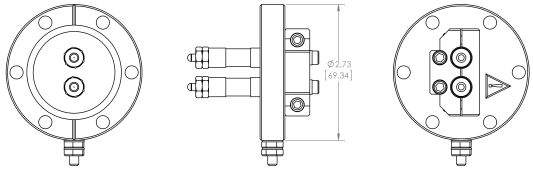
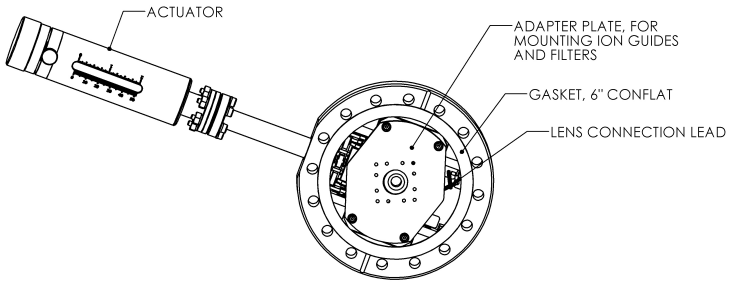


Figure 6:
70 mm CF flange with RF feed-throughs.



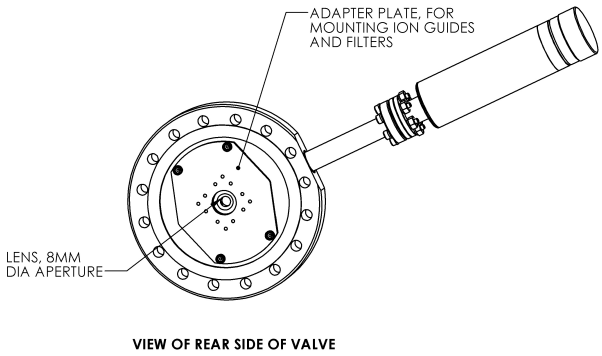


Figure 7:
160 CF Gate Valve with Integrated Optics.

Typical Usage of Mounting Flanges

Extrel has a long and respected history of allowing its customers to meet unique and custom analysis layouts by providing answers to challenging layouts and system setups.

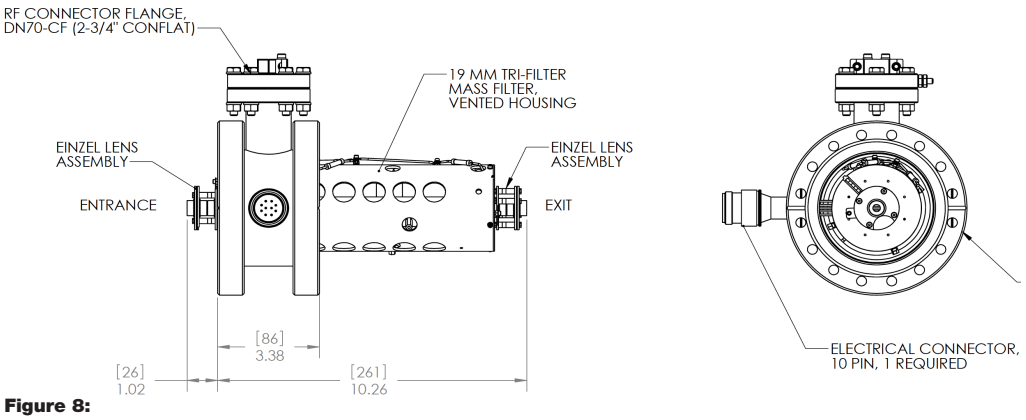


Figure 8:

Usage of a radial mounting flange for creating in system additions

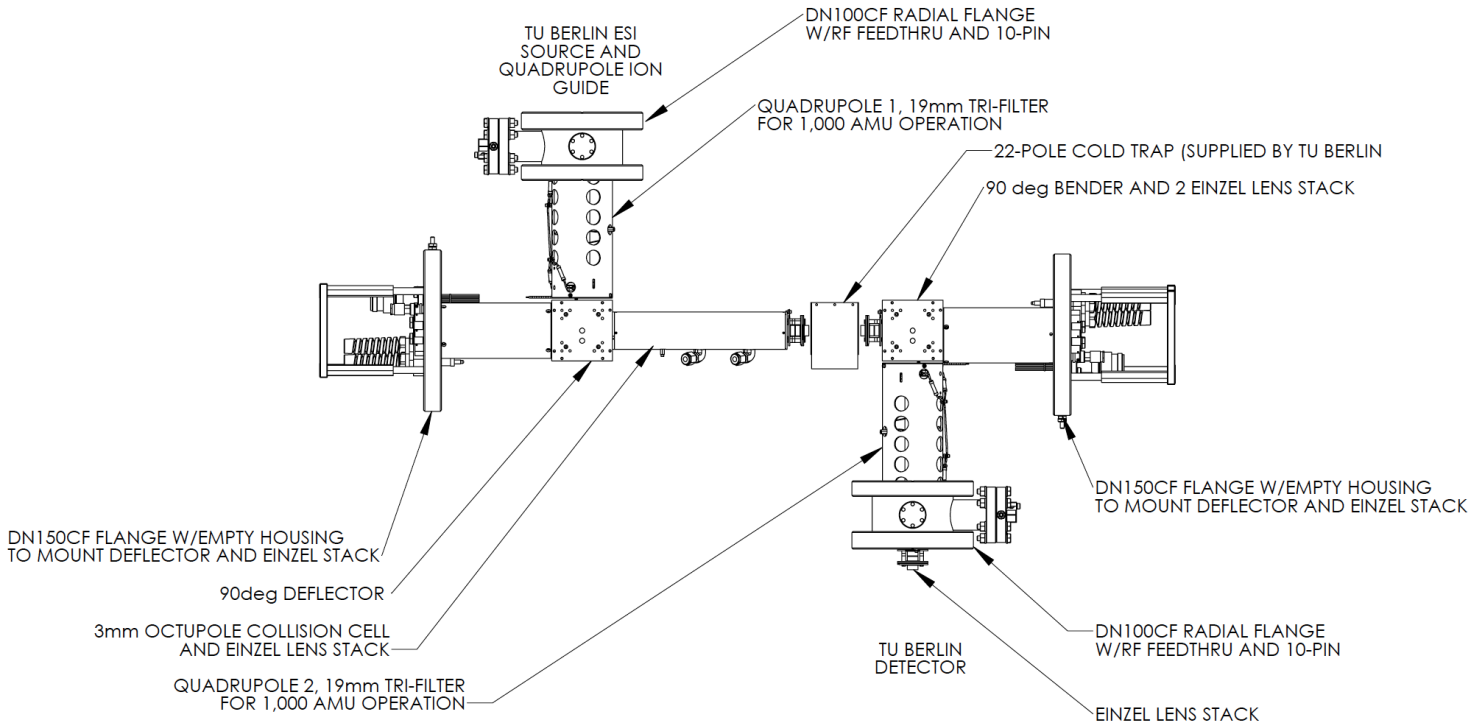


Figure 9:

Complete system layout using radial flanges and multipole and TQMS component.

Extrel

Custom Equipment & Systems

Custom Equipment & Systems

Extrel has been building specialized and custom components and system since 1964. Our experience in engineering and building custom equipment coupled with our extensive application knowledge can save our customers both time and money.

Custom Equipment and Systems Overview

Over the years, Extrel has developed a wide variety of specialized components. Some have become standard components and some have gone into our library for future reference. This background makes it very likely that we have already developed a component or system similar to the one you need.

Custom components and systems include but are not limited to:

- **Ionizers and Ion Optics**: We can build specialized ionizers with custom ports, filament materials, shielding and inlets. Ion Optics can be made to your design. They can be various lengths and designed to enhance pumping or work high energies. We can make right-angle and multi-port optics.

- **Ion Guides and Collision Cell:** We have built both special length and special configuration Ion Guides that can be designed to fit in existing systems or for specialized applications.

- **Mass Filters and MS/MS Devices:** Quadrupole Mass Filters can be designed with special housings and apertures, with custom optics and specialized connections. They can also be made from special materials. MS/MS Devices can be made with any combination of Mass Filters, Ion Guides, Ion Optics and Collision Cells.

- **Detectors and Mounting Flanges:** Custom Flanges and detector mountings are available that can be designed to fit into existing system or to fit special applications. Both the material and the size of flanges can be custom made along with the type and number of feedthroughs.

- **Custom Length Cabling:** If the standard length cables are too short for your situation then longer cables will allow you to place the electronics where you would like them.
  Please note, there are restrictions on the length of RF cables; changing the length of the RF cables may change the Mass Range and performance of our systems.

- **Software Customization:** The Extrel Software packages are extremely versatile. This allows for application specific software development.

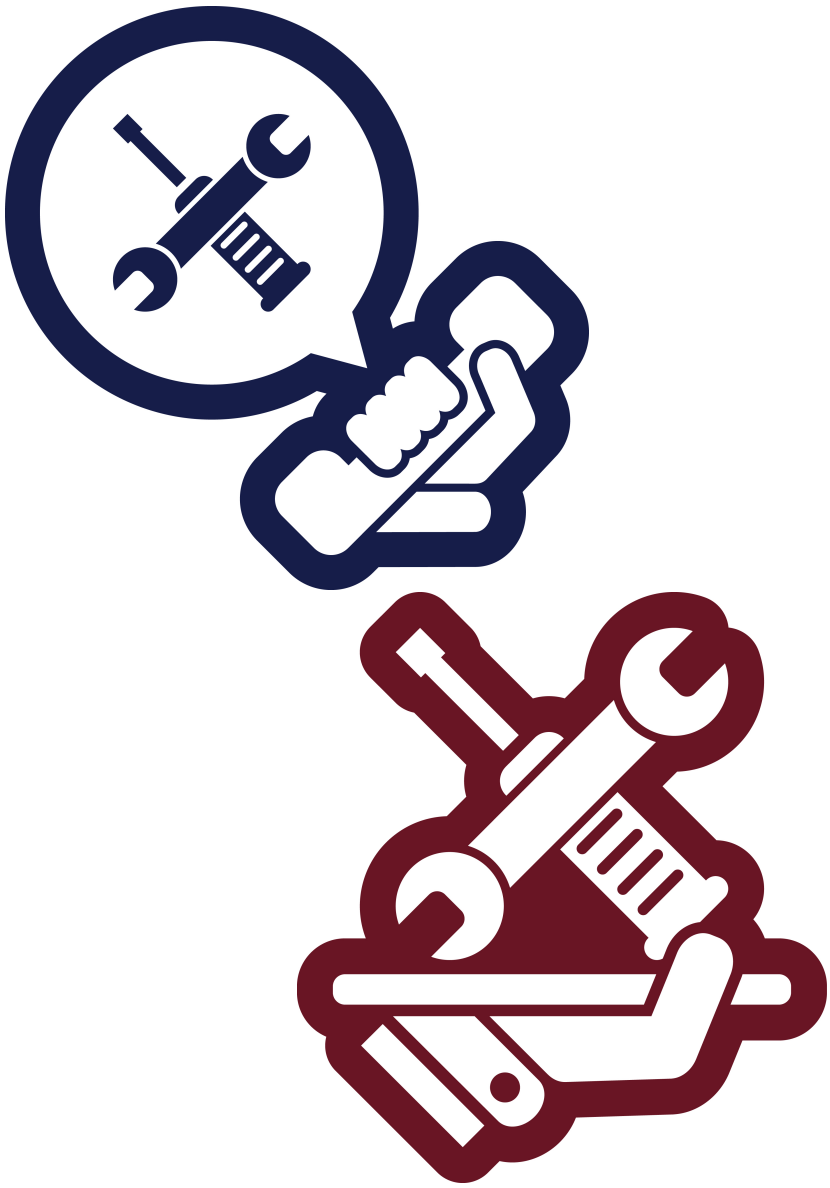
- **Vacuum Chambers**: Extrel can design specialized chambers to fit your application.

- **Gas Handling and Valving:** Extrel has decades of experience building specialized gas manifolds, gas mixing systems, and custom sample porting and valving.

- **Systems:** If you do not have the engineering expertise or manpower to design and build a system designed for your application, let Extrel's experience do the work for you. We have built custom gas analysis systems, material analysis systems, deposition systems, and specialized, multi-technique MS/MS systems.

Extrel

Training and Support Options



We recognize that every customer requires different levels of support, and so we offer a variety of Services and Support Contracts. Services include Training, Field Service, Preventative Maintenance, and Remote Support. But the one thing that every customer needs is to know that they can get expert help when they need it. Extrel's Customer Service and Support team is made up of Factory Trained and Certified support personnel located around the world to provide the highest quality support close to the customer.

Training & Support

Installation and Training

2-Day Installation/Training(US Domestic): Installation includes system inspection, assembly, PC configuration, and system optimization. On-site training includes hardware and software overview by an Extrel Service Representative. Service personnel will be on-site during normal working hours not to exceed 8 hours per day. All travel and living expenses are included. (If purchased Extrel will extend the Remote Support Program support hours for an additional year)

1-Day On-site Training (US Domestic): On-site training includes component overview, system optimization, and detailed software functionality testing and operation by an Extrel Service Representative. Service personnel will be on-site during normal working hours not to exceed 8 hours per day. All travel and living expenses are included.

1-Day On-site Application Support (US Domestic): On-site Application support includes pre-sale engineering configuration and system application integration, optimization by an Extrel Chemist. Service personnel will be on-site during normal working hours not to exceed 8 hours per day. All travel and living expenses are included.

2-Day Quadrupole Mass Spectrometer Operational Training School: This training school, conducted at Extrel's facility, Pittsburgh, Pennsylvania, offers practical Quadrupole Mass Spectrometry operation including spectral interpretation and specific operational training on Extrel Mass Spectrometers. All travel and living expenses are the responsibility of the customer.

International Installation/Training: Installation includes system inspection, assembly, PC configuration, and system optimization. On-site training includes hardware and software overview by an Extrel Service Representative. Service personnel will be on-site during normal working hours not to exceed 8 hours per day. All travel and living expenses are included. (If purchased Extrel will extend the Remote Support Program support hours for an additional year). Discount may apply when purchased with the instrumentation. If purchased separately, international rates are quoted by Extrel Technical Support.

Remote Support Services:

Remote Support provides the customer access to technical support personnel when on-site support is not required, desired, or feasible. These services can include application support, basic training, trouble-shooting, and remote control (Desktop Support) of your system if your computer has remote desktop capability.

Desktop Support offers the ability to diagnose and often resolve problems via remote control software reducing down time and possibility eliminating a service call-out. This option requires a broadband internet connection, supplied by the customer, connected to the Host computer and remote control software recommended by Extrel but installed by the customer. No guarantee of consistent connection or outcome.

4 hours or 1-year (whichever occurs first) of combined technical remote support including desktop support
Note: Discount rate applies only if ordered when equipment is ordered. Contact Extrel Technical Support for price without equipment.

Remote Support Services:

8 hours or 1-year (whichever occurs first) of combined technical remote support including desktop support

Note: Discount rate applies only if ordered when equipment is ordered. Contact Technical Support for price without equipment.

4 hours or 1-year (whichever occurs first) of combined technical remote support including desktop support

Note: When ordered separately from equipment.

8 hours or 1-year (whichever occurs first) of combined technical remote support including desktop support

Note: When ordered separately from equipment.