

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 application.

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.

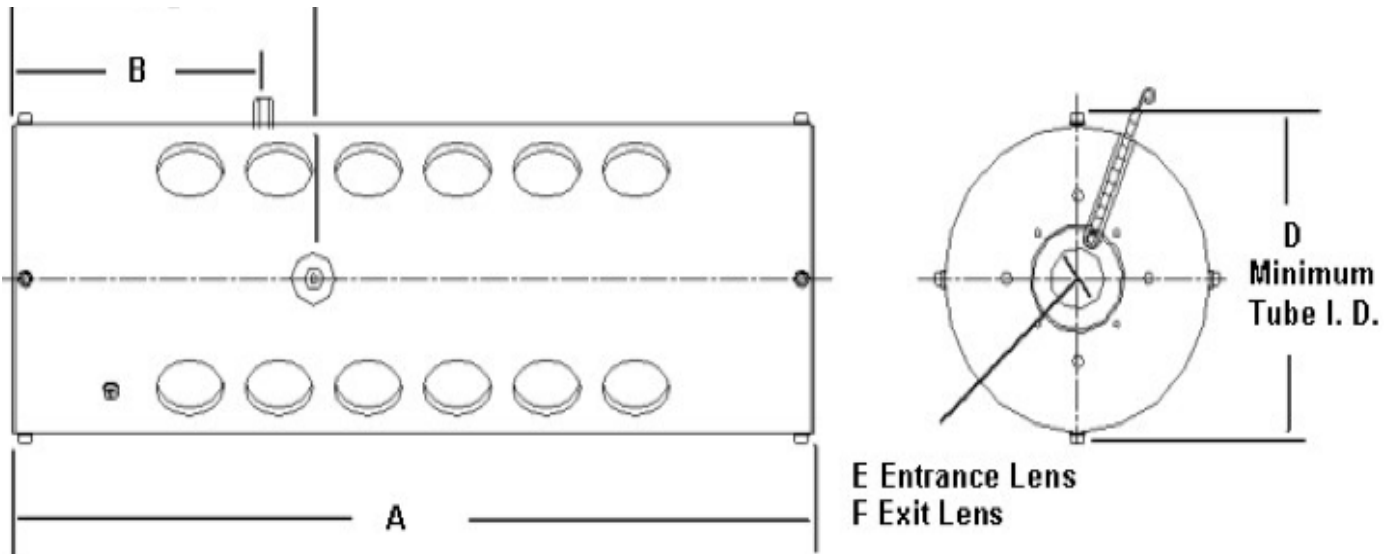
The information below should be used as a rough guide for choosing the Quadrupole Mass Filter for your application. For more information contact your local Extrel Representative.

MAX System Mass Range and Performance

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

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

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Quadrupole Dimensions in mm

Device	A	B	C	D	E	F
9.5 mm Quadrupole without Housing	200.07	78.61	93.85	54	NA	NA
9.5 mm Quadrupole with Housing	219	77.21	92.45	101	7.62	7.62
19 mm Quadrupole without Housing	210	62.73	78.98	63.5	NA	NA
19 mm Quadrupole with 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

Multipole Devices



19 mm Quadrupole Mass Filters

Part # Description

- 814191** 19 mm (3/4 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.

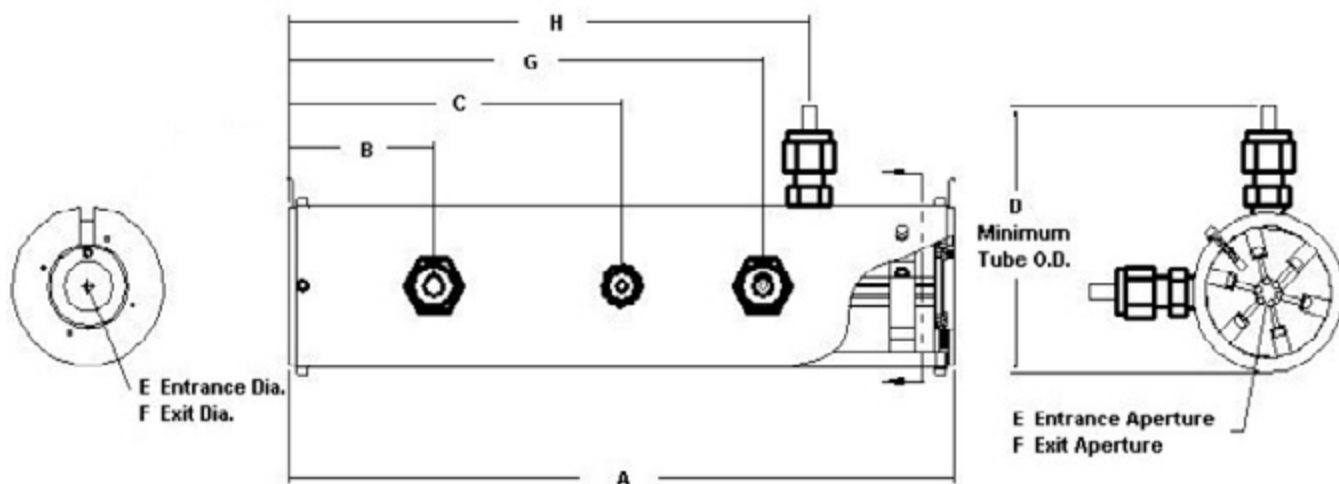
For more information on our line of MS/MS components contact your local Extrel Representative.

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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	xxxxx	660	1	1	101	15.24	15.24	1	1
Qo with 9.5 mm Quadrupole with Hexapole	xxxxx	422.27	1	1	101	7.62	4.5	N/A	N/A
Qo with 19 mm Quadrupole with 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	xxxxxxx	205.48	N/A	N/A	54	4.8	4.8	N/A	N/A
Hexapole with Standard Housing, Entrance and Exit Lenses	xxxxxxx	219.2	156	171.45	101	2.8	2.8	N/A	N/A
Hexapole with Vented Housing, Entrance and Exit Lenses	xxxxxxx	219.2	156	171.45	101	2.8	2.8	N/A	N/A

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



MS/MS Device Dimensions: Hexapole Collision Cell shown.

Multipole Devices

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 Collision 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)

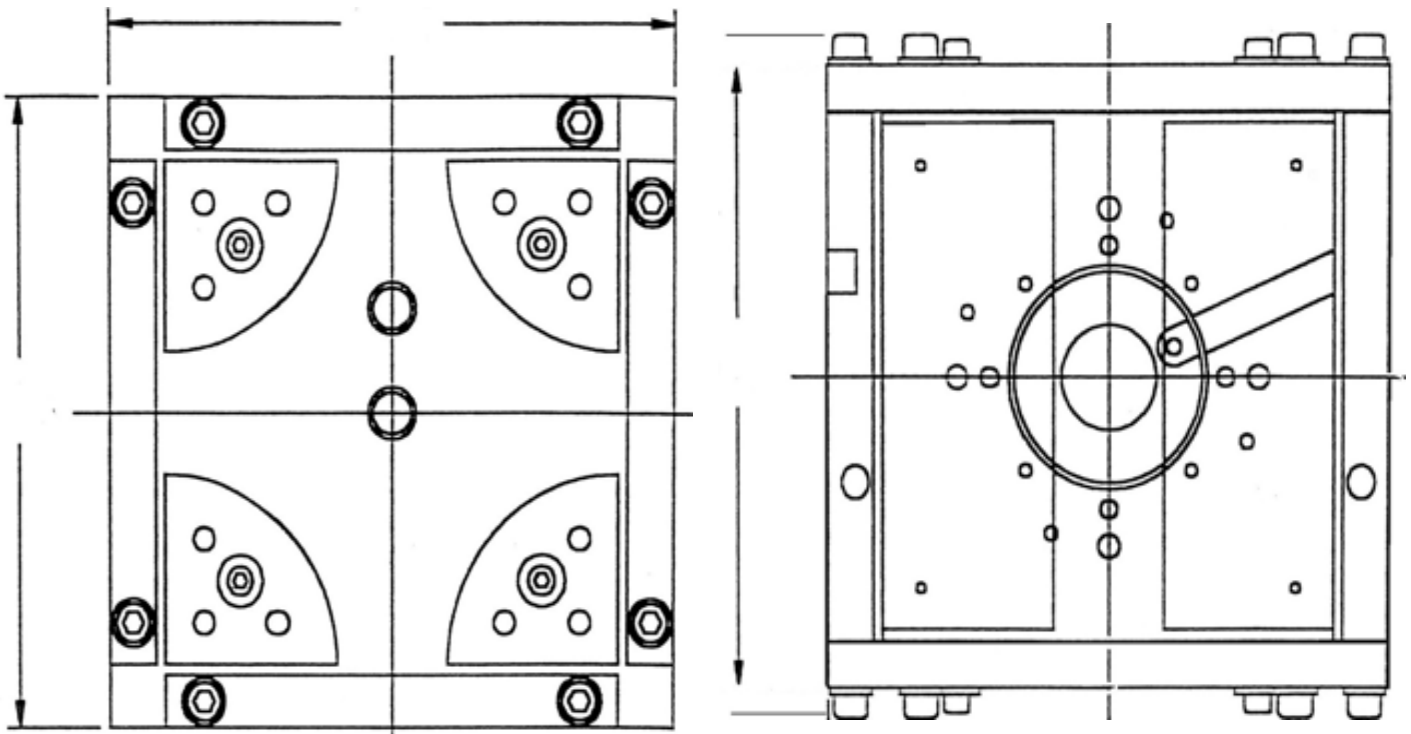


Ion Deflectors and Ion Optics Components

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.

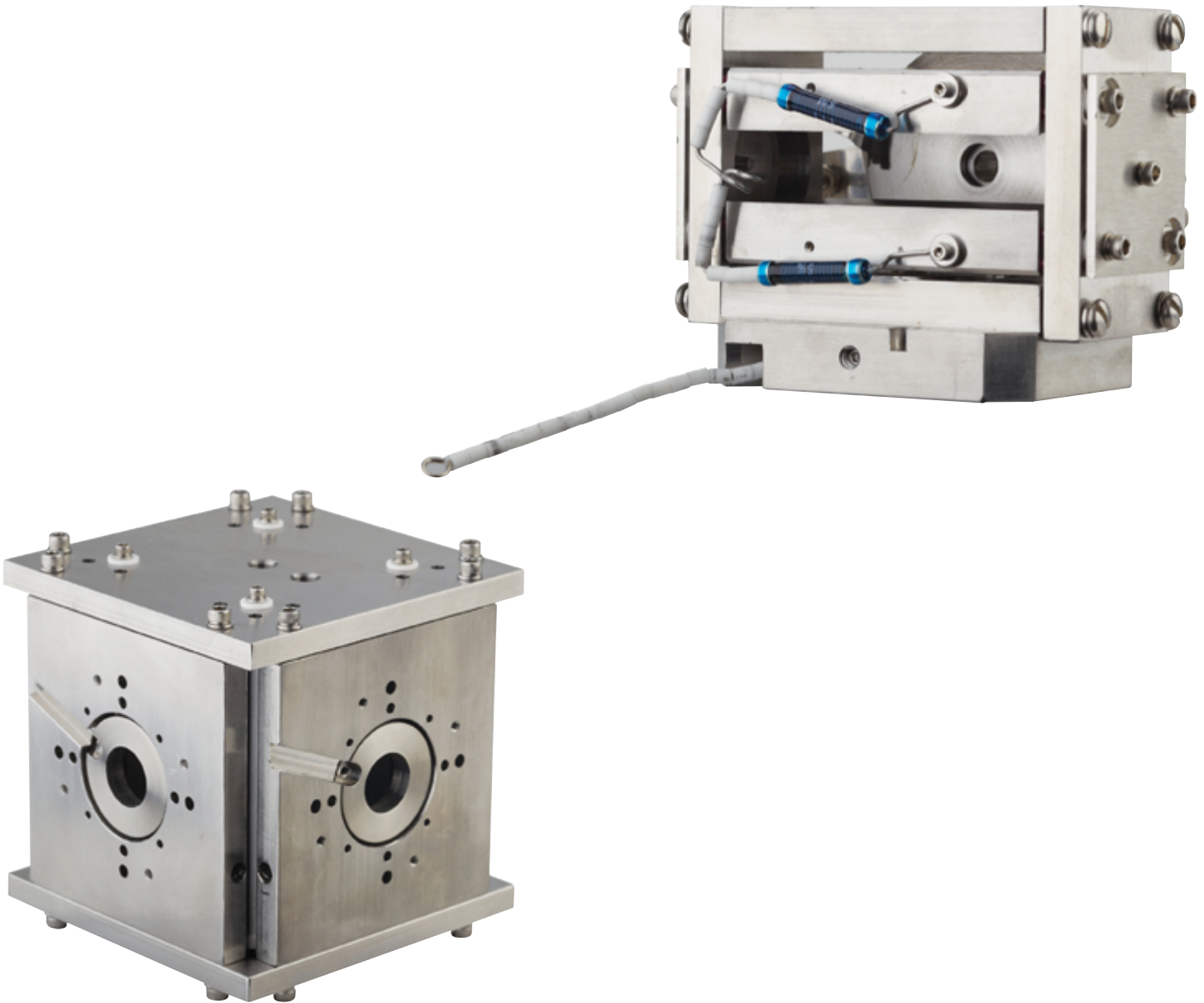
Part #	Description
811989	Quadrupole Deflector/Energy Filter. Ions can be sent 90°, 180°, or 270° from entry axis, requires 150 mm (6-inch) I.D. tube for insertion
814715	Compact Quadrupole Deflector/Energy Filter ion can be deflected 90° from entry axis
812174	Einzel Lens Stack
814150	Custom Ion Optics Lens Designs



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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.