



BEAM HANDLING COMPONENTS

National Electrostatics Corp.

Beam Defining Slits

For a variety of applications involving the control of ion beam size and current, NEC manufactures three basic models of slit systems, and a number of variations, with different beam power capabilities and geometries. Most NEC slits are equipped with insulated elements for current read. Most models are available in manual or motorized versions.



APPLICATIONS

NEC slits are ideal for applications requiring accurate control of beam size, determination of beam divergence, or limiting beam current. The NEC line of slits is designed for use on injection and post acceleration beamlines of medium to high current or post acceleration electrostatic accelerators. NEC slits are also commonly used for ion beam energy control in conjunction with NEC's Terminal Potential Stabilization systems.

With a power rating of 50 W to 1000 W, the NEC line of slits is suitable for a wide variety of applications for control of ion beam energy, current, or size.

DESIGN

All NEC slit assemblies incorporate proven NEC technology with all-metal and ceramic construction for ultra-high vacuum compatibility.

There are two slit elements per axis in each slit assembly. The slit elements utilize all-metal seals to the slit housing and motion is transmitted to the elements through stainless steel welded bellows. The beam aperture material and the slit elements are either molybdenum or tantalum, allowing for beam power of up to 1000 W (BDS6) without severely damaging the elements.

Listed below are the standard model slit assemblies manufactured by NEC and their beam power ratings and aperture diameters. The beam power ratings are conservative and based on tests at NEC. Power rating is based on a beam of uniform power density with a minimum diameter of 3 mm fully incident on a single slit element. In normal operation, much of the beam will pass between the slit elements.

Model	Power Rating	Maximum Aperture	Cooling Method
BDS6	1000 W	1.5"	De-ionized water
BDS8	50 W*	1.2"	Radiation only
BDS18	50 W*	2.0"	Radiation only

**100 W version available upon request*

OPTIONS

Manual and Motorized

All models are available in manual or motorized versions. Motorized BDS6 and BDS8 slits are electric motor driven with a 10 turn potentiometer to monitor slit element position. Though 24 VDC motors are standard, 115 VAC motors are also available. The motorized BDS18 is operated via stepper motors that provide finer adjustment than the 24 VDC motors.

Single and Double

All models are available in single axis (2-jaw) and double axis (4-jaw) versions. The double slits (4-jaw) consist of two pairs of slit elements to provide beam definition in the X and Y directions. Single slits (2-jaw) are available for applications requiring beam definition in only one dimension.

Element Type and Material

The standard BDS8 and BDS18 are designed with slit elements with beveled edges. This design minimizes slit edge scattering of the ion beam and is the best element configuration for beam energy control.

If a higher power rating is needed for the BDS8 or BDS18, the elements can be furrowed. This design increases the power rating for each element to 100 W.

Other element designs are available upon request such as a folded design for applications requiring complete closure and square edge elements that provide the most resistance to sputter erosion. Please contact NEC for further information on these element types or on element options for the BDS6.

The standard element material for the BDS8 and BDS18 is tantalum, though Sigradur elements are available for the BDS18. The standard element material for the BDS6 is Molybdenum, though tantalum elements are also available.

Travel

Each model varies in range of adjustment, with the largest being the BDS18, which has a 2.0 maximum beam opening. The manual BDS6 and some versions of the manual BDS8 allow some over-center travel, permitting an off-center aperture. Motorized slits do not allow over-center motion.

Customization

Standard flanges used are 6.0" OD ConFlat flanges. Other flange size and type may be available upon request. In addition, custom slit systems designed into common housings with other NEC components, such as Beam Profile Monitors and Faraday Cups, are also available. Other customization to meet customer specific needs may be available upon request.

ACCESSORIES

For a complete manual slit system a slit, slit current monitor, and a log amplifier are needed.

NEC offers a slit current monitor with four meters for simultaneous display of individual element currents and are switchable to monitor up to three different slit assemblies on the front panel. A complete line of dual channel log amplifiers are available.

For a complete motorized slit system a motorized slit, slit position controller, and log amplifier are needed.

For motorized BDS6 and BDS8 slits, NEC offers a local and a remote controller. These controllers provide independent slit element position controls, slit position readout, and connectors for monitoring the current on each slit element.

Please contact NEC for information regarding control of the BDS18.



The local slit controller has switchable analog meters which display the slit position and current read.



BDS6

Power Rating: 1000 W

Max. Aperture: 1.5" (3.8 cm)

The model BDS6 is designed for use on the post acceleration beamlines of high current or high energy electrostatic accelerators. Conservatively rated at 1000 W of continuous beam power with de-ionized water for cooling, this slit can safely dissipate the heat generated by a 3mm or larger ion beam directly incident on any of the molybdenum slit elements (tantalum elements optional). The slit elements are bolted to water cooled copper blocks for rapid heat dissipation. Electrical isolation (greater than 1000M Ohms) is maintained by the use of de-ionized cooling water and ceramic fluid feedthroughs. The elements of the BDS6 are cylindrical in cross section to provide maximum cooling for this high power unit.

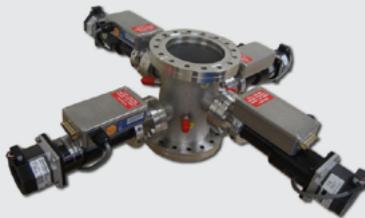


BDS8

Power Rating: 50 W (100 W optional)

Max. Aperture: 1.2" (3.0 cm)

The model BDS8 is designed for use on the post acceleration beamlines of medium current electrostatic accelerators and on injector beamlines of large electrostatic accelerators. Conservatively rated at 50 W of continuous beam power without requiring air or water cooling, this slit can safely radiate the heat generated by a 3 mm or larger ion beam directly incident on any of the tantalum slit elements. The elements have a beveled edge that is designed to minimize slit edge scattering of the ion beam. Folded and square edge elements are available upon request. Furrowed elements, rated at 100 W, are also available.



BDS18

Power Rating: 50 W (100 W optional)

Max. Aperture: 2.0" (5.1 cm)

The model BDS18 is similar to the BDS8, including the beam power rating and slit elements. However, the BDS18 has a larger range of adjustment and the motorized versions use stepper motors instead of 24 VDC motors. This allows for finer adjustment capability.

All three models are available as manual or motorized and single (2-jaw) or double (4-jaw) axis.

SPECIFICATIONS

	BDS6	BDS8	BDS18
Power Rating:	1000 Watts/element	50 Watts/element 100 Watts/element optional	50 Watts/element 100 Watts/element optional
Leakage Resistance	>1000M Ohms at 500V	>1000M Ohms at 500V	>1000M Ohms at 500V
Adjustment Resolution:	0.001" (0.025mm).	0.001" (0.025mm)	0.001" (0.025mm)
Adjustment Sensitivity:	0.0625" per turn of adjustment knob-	1.0mm per turn of adjustment knob	0.025" per turn of adjustment knob
Range of Adjustment:	-0.25" to +0.75" per element (1.5" max. beam opening)	0 to +0.6" per element (1.2" max. beam opening)	0-1" per element (2.0 max. beam opening)
Position Readback: (remote models only)	2K Ohms per 10 turns (10K Ohms optional)	2K Ohms per 10 turns (10K Ohms optional)	
Separation of Element Pairs:	1.5" (4 jaw model)	1.25" (4 jaw model)	1.25" (4 jaw model)
Cooling:	Deionized water (0.5 l/min. for 1000W rating)	Radiation	Radiation
Element Material:	Molybdenum (Tantalum optional)	Tantalum	Tantalum (Sigradur optional)
Housing:	Stainless steel	Stainless steel	Stainless steel
Length Along Beamline*:	8.0" for 2 jaw assembly 9.5" for 4 jaw assembly	5.88" for 2 jaw assembly 7.13" for 4 jaw assembly	5.875" for 2 jaw assembly 7.125" for 4 jaw assembly
Electrical Connections**:	One BNC/element	One MHV/element	One MHV/element
Standard Flanges***:	6.0" O.D. NEC or CF (blind tapped)	6.0" O.D. NEC or CF	6.0" O.D. NEC or CF

*Length based on CF flanges: May vary with NEC or other style flanges.

** Other connection types may be available upon request

***Other flange size and type may be available upon request.

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