

# Beam Diagnostic Instrumentation System 5000

The Beam Diagnostic Instrumentation, System 5000, is based on a development at the Hahn-Meitner Institute, Berlin and provides potential users with a complete line of beam diagnostic instrumentation from Danfysik, including both mechanics and associated electronics.

Basic criteria considered in the design of the components were:

- \* High vacuum •  $10^{-7}$  Torr • all metal seals
- \* Designed for heavy ion beams with 1000 W beam power
- \* Wide dynamic range
- \* Fast and reliable control
- \* Tune up times kept to a minimum
- \* Direct pick-up of beam currents on BPM and Faraday Cups
- \* Components fit standard CF housings
- \* Flanging NW 100 CF or NW 150 as standard

## Water Cooled Slit 563

Precise and stable mechanical alignment and symmetry. Withstands 1000 W beam power. Slit width adjustable to an accuracy of 0.04 mm.



## Faraday Cup 568

Precise beam current measurements. Withstands high beam power without deterioration of sensitivity. Cooling good up to 400 W when mounted on Actuator 566. Excellent insulation due to the use of BeO insulating material.



## Water Cooled Actuator 566

Fast and reproduceable positioning of elements in the beam path. Pneumatically operated and electrically activated. Mounting block water-cooled via coaxial water pipes. 1000 W cooling capability.



# Faraday Cup 568

## Features

- Precise beam current measurement
- Withstands high beam power without deterioration of sensitivity
- Cooling good up to 1000 W (when mounted on Actuator 566)
- Easy exchangeable cup electrode

## General description

The Faraday Cup 568 is designed for precise current measurement of high energy particle beams. A major design aim was to obtain a unit which will withstand high beam power, without deterioration in current sensitivity and accuracy of measurement.

The beam stopper in the bottom of the cup is clamped to the cup body; a spacer of beryllium oxide isolates the cup body and the cooled support electrically from each other, but ensures high thermal conductance between them. Two aperture plates are located in front of the cup.

The first defines the maximum diameter of the beam which can enter the cup and also shields the second (bias) aperture plate from being hit by particles which could release secondary electrons.

The second aperture plate is negatively biased and suppresses the emission of secondary electrons from Faraday Cup itself and also prevents secondary electrons, released by ion beam bombardment of the first aperture plate, from reaching the Faraday Cup.

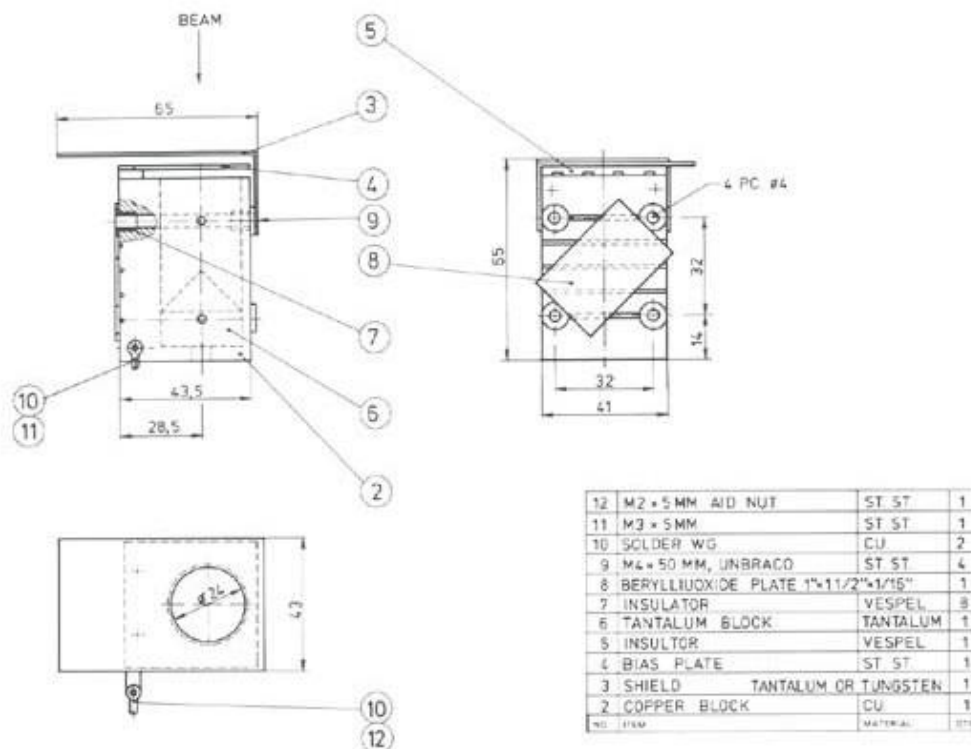
In a typical application the cup is connected to a six-decade linear current voltage converter (preamplifier 537/548) feeding a current meter to the control desk. By using a short cable between the cup and the preamplifier input the user has the possibility to observe beam intensity modulations on an oscilloscope.

The preamplifier 537/548 contains the required bias supply for the 568, variable up to 100 V DC.

## Specifications

|  |                            |
|--|----------------------------|
| Maximum allowable power dissipation:<br>(when mounted on actuator 566 with rated flow) | 1000 W*                    |
| Acceptance diameter of first beam aperture:<br>"absorbing" electrode shaped as cone:   | 24 mm Beam<br>tantalum     |
| Accuracy of beam current measurement:  | 1% or better               |
| Electrical insulation of cup electrodes:   | $10^{12}$ Ohm at 20°C      |
| Bias voltage for secondary electron suppressing electrode:                             | min. -30 VDC/typ. -100 VDC |

NB! The front aperture must not be hit by the full beam intensity i.e. appropriate beam limiting apertures must be provided upstream of the cup.



# Water Cooled Actuator 566

## Features

- Fast and reproducible positioning of element in the beam path
- Pneumatically operated and electrically activated
- Mounting block water-cooled via coaxial water pipes
- 2000 W cooling capability
- Five insulated solid wire connections available at BNC receptables
- End stop externally adjustable
- Status read out by micro switches

## General description

The Water Cooled Actuator 566 is designed to be used where fast and reproducible remotely controlled positioning of objects in the beam path is desired (e.g. Faraday Cups, Apertures, ect.).

The linear motion is made with the pneumatic cylinder operating on pressurized air being controlled by an electric solenoid valve; adjustable micro switches are provided for actuator position information.

The linear motion is sealed by a stainless steel bellows. The actuator is provided with a water-cooled mounting block with high power dissipating capability.

Close to the mounting block are 5 solid wires available each with a ceramic feed through. Thus the wires are fixed within the vacuum and eliminate the possibility of broken wires which else would require a disassembly of the vacuum system.

## Specifications

Thermal resistance of cooling surface of mounting block to water inlet temp.:

Approx. 0.1°C/W

At a flow of approx. 0.7l/min. giving a ΔT water of 40°C at:

2000 W

General max. linear stroke:

50 mm

Air pressure, min.:

5 bar, typ. Control

valve, solenoid data (other voltages and frequencies available on request):

220 V AC, 50 Hz

Micro switches (not shielded):

260 V AC, 10 AMP

Flanging as standard:

NW100CF

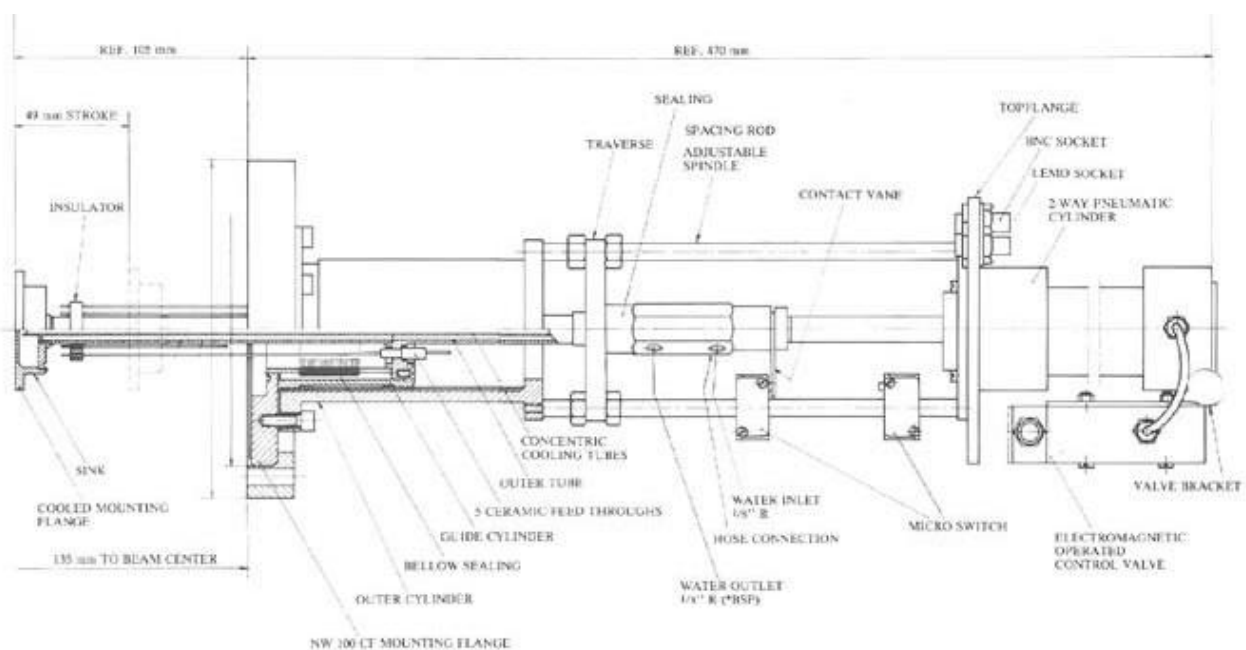
Cooling water connection:

R 1/8" (BSP)

Air connection:

air hose Ø int. = 2.5 mm

Ø ext. = 4.0 mm



## Water Cooled Slit 563

### Features

- Precise and stable mechanical alignment and symmetry
- Easy and reproduceable adjustment
- Withstands 1000 W beam power
- Slit width adjustable to an accuracy of 0.04 mm
- 10-turn potentiometer (optional)

### General description

In the Water Cooled Slit 563 the water cooled mounting blocks for the slit jaws are mounted on coaxial tubular supporting rods which are also used for feeding cooling water to the blocks. The blocks are electrically insulated from the jaws by BeO spacers. The jaws are individually connectors to BNC receptables.

Sleeves welded to the outer tubes move the mounting rods axially via a worm gear. Vacuum sealing between the moving rods and the base flange is obtained by means of flexible stainless steel bellows.

Rotation of the worm gear moves the slit jaws in opposite directions to each other and the center line between the slit edges stays fixed. However, the center line can be adjusted manually by turning the worm wheels when the worm shaft is demounted.

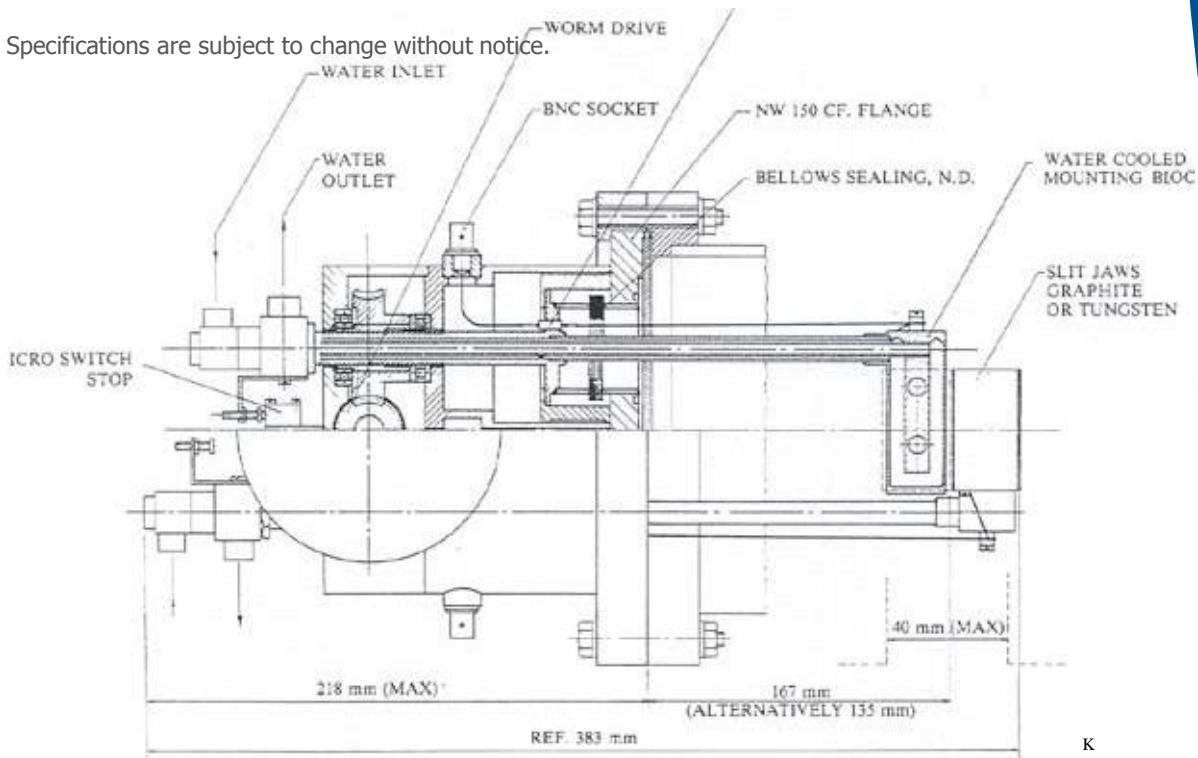
Setting and adjustment of the slit width is controlled via a stepping motor driving a worm gear.

A 10-turn potentiometer (optional), coupled to the worm gear, permits getting information on the slit width via a resistance measurement or voltage measurement. Motor driver and width control/read-out instrumentation is not included in the slit model 563 delivery from Danfysik (must be provided and implemented by the customer).

### Specifications

|  |             |
|--|-------------|
| Min. slit opening:                     | 0 + 0.1 mm  |
| Max. slit opening:                     | 35 + 0.1 mm |
| Min. increment in adjustment:          | 0.04 mm     |
| Accuracy of setting:                   | 0.1 mm      |
| Center line changeable in steps of:    | 0.07 mm     |
| Max. allowable beam power dissipation: | 1000 W      |
| Flange:                                | NW150CF     |

Standard jaws are made of Tungsten. For higher energies, high density graphite can be offered to limit permanent activation.



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