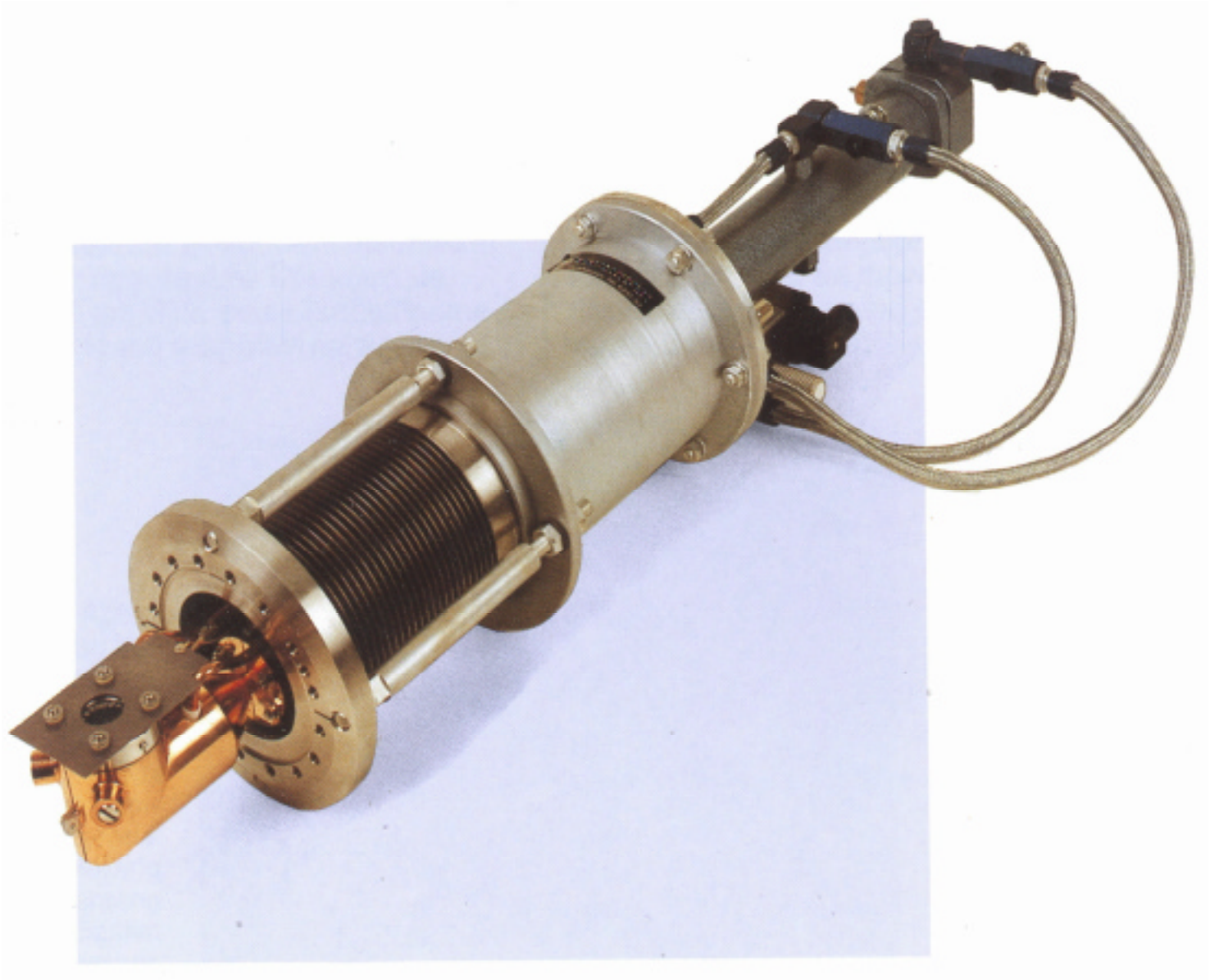
Coaxial Faraday Cup

Type DF 040



PRINCETON SCIENTIFIC
CORPORATION

Tel: (609) 924-3011 • Fax (609) 924-3018
www.PrincetonScientific.com
Email: info@princetonscientific.com

COAXIAL FARADAY CUP Type DF 040

Application:

Measurement of particle beam intensity distribution versus time (= measurement of bunch-structure at rf-accelerator).

Principle:

Bunches are stopped on the inner conductor of a beam stopper which is part of a matched coaxial transmission line. The current signal is transferred (bandwidth 2 GHz) to a subsequent broadband signal-processing system. For suppression of secondary particles, influenced fields (for cases in which **'v'** particle is less than **'c'**), and for shielding against rf-noise, a grid is provided in front of the beam stopper itself. The coaxial faraday cup can be moved into beam by means of a compressed air actuator/linear vacuum feedthrough.

Fig. 1
Head of coaxial faraday cup with upper cover removed; also shows inner and outer conductor, ceramic supports and cooling pipes. In the center of of photograph, please note the suppression grid. At right of photograph the inner conductor is shown.

NOTE: Conical end of cup body to ensure compatibility with the 50 Ohms connector.

Technical Specifications:

Material		
inside vacuum	:	Stainless steel
outside vacuum	:	Nickel plated steel
Beam stopper	:	Copper body (cooled) with tantalum plate used for target material.
Grid	:	Tantalum (ceramic insulation)
Diameter of stopper plate	:	0.92 inches
Stroke of 'in' and 'out' movement	:	3.54 inches

Cover Photograph: *Coaxial Faraday Cup mounted to a 6" O.D. (CF-100) flange (also shown: compressed air linear actuator, tantalum shielding ring, bellow, grid with outer conductor). Inserted on the right side (one piece of outer conductor removed): inner conductor with tungsten stopper plate, cooling water pipes, 50 Ohms tapered line, mini conflat flange, vacuum sealed connector.*

Technical Specifications (continued):

Accuracy of position vs. beam axis	:	0.012 inches
Drive ('in' and 'out' motion)	:	Tandem compressed air actuator
Pressure	:	60 - 90 psi
Sealing	:	CF system, stainless steel construction
Support flange	:	CF-100 (6" dia. O.D.) fits standard diagnostic chamber.
Maximum leak rate	:	10^{-9} Torrs x liters/second
Insulation of inner conductor	:	Ceramic
Impedance	:	50 Ohms
Connector	:	N
Transmission line bandwidth	:	Approx. 2 GHz
Reflection	:	Less than 10 % (for a test pulse of 25 psec. rise time).
Suppression of secondary particles	:	Grid in front of stopper plate.
Cooling of inner conductor	:	Cu-tubes with ceramic insulation.
Cooling fluid	:	Deionized water (recommended conductivity (2.5 - 25) x 10^{6}mho/inch).
Required cooling of water (60 psi)	:	85 gallons/hour
Maximum beam power	:	4 kW
Protection in the event of drop in air pressure .	:	Automatic locking device to hold stopper ' clear of beam path'
Position indicator .	:	Both positions 'in' and 'out' of beam are identified via two (2) micro-switches type C.
Damping of 'in' and 'out' movement:	:	Variable
Compressed air control :	:	Magnetic value (24 V d.c., 0.5 A)

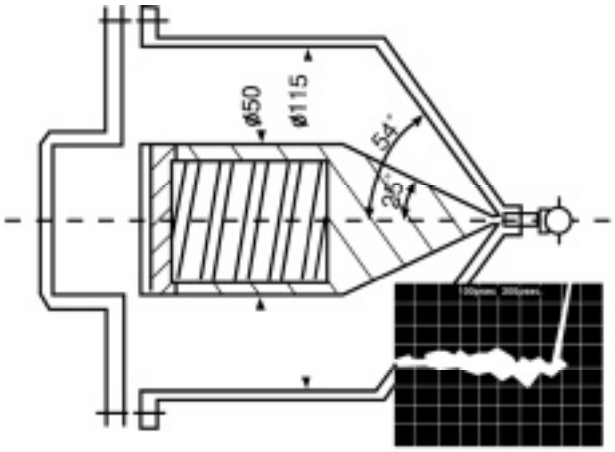
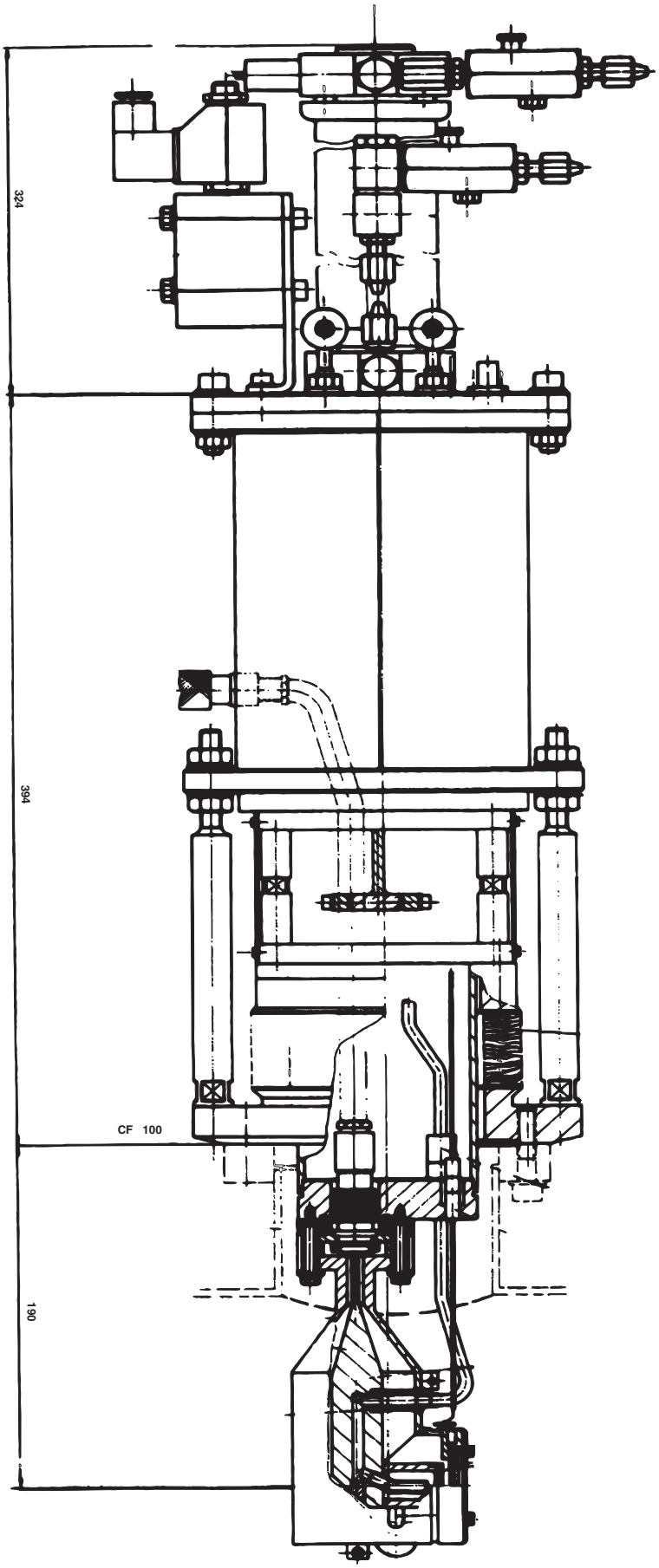


Fig.2
Schematic of head of coaxial faraday cupprovided for particles with ranges in the rder of some inches. Insert at right shows measured reflection ratio (less than 10 % for a 25 psec. test pulse.

Description: Cup is designed in 50 Ohms geometry. The diameter of stopping plate is 50 mm. Thickness of stopping material is 5 cm Cu, which corresponds approx. to range of 200 MeV protons. Max. beam power which can be stopped is 20 kW. Mounted to compressed air actuator.



Dimensions in Millimeters **DF 040**