

**PELCO<sup>®</sup> FARADAY CUP**  
**Product Numbers 651 and 651-A through M**



Cross section of Pelco<sup>®</sup> Faraday Cup

**General Information and Background**

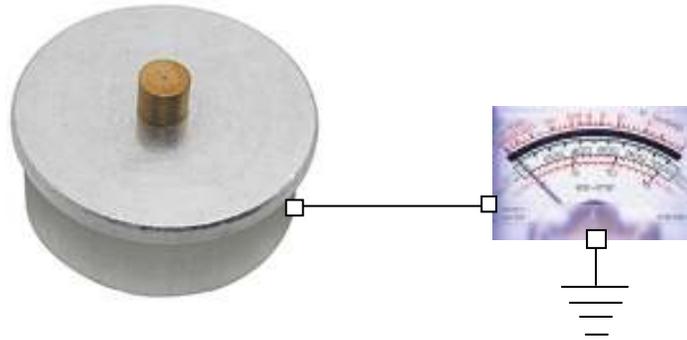
A Faraday Cup enables accurate measurement of a focused beam of electrons or ions. It is basically an enclosed cavity with a small opening to collect charged particles which enter the cavity and feed the charge to a sensitive pico-ammeter. Some electron microscopes can calculate the electron beam current, but that is not nearly as accurate as an actual measurement. Measuring the beam current in the column is fine for stability and comparison measurements but only gives an estimation of the exact beam current reaching the sample surface. The small aperture opening (typically 100um or less) of the PELCO<sup>®</sup> Faraday Cup and the larger cavity behind the aperture prevent backscatter electrons from escaping in the chamber. All primary, backscattered and virtually all secondary electrons are absorbed in the Faraday Cup providing accurate beam current measurements.

**Product Description**

The PELCO<sup>®</sup> Faraday Cup is made from brass with overall dimensions of 2.5mm diameter and 2mm height. The aperture size in the top is 100um. The cavity size is approximately 1.5 x 1.5mm. The PELCO<sup>®</sup> Faraday Cup is either supplied on a SEM mount or can be mounted on a SEM mount, sample holder or even the SEM stage by the customer. When mounted the aperture opening should be orientated towards the pole piece. The PELCO<sup>®</sup> Faraday Cup can either be mounted by press fit or can be easily mounted using a small amount of carbon paint. When supplied on a SEM mount the Faraday cup is bonded into a .5mm deep counterbore on that SEM mount.

The pico-ammeter needed to measure the beam current has to be provided by the customer. Either use the absorbed current meter in your SEM, FIB or Microprobe or use a pico-ammeter such as the one made by Keithley.

## Directions to use the PELCO® Faraday Cup



When using the PELCO® Faraday Cup on your SEM, FIB or Microprobe system make sure that the holder with the PELCO® Faraday Cup will be properly electrically connected to the sample stage. When your system is fitted with an absorbed current meter you can use this device to measure the beam current in the Faraday Cup. If your system does not include an absorbed current meter you have to provide one such as the pico-ammeter from Keithley and use a ground connection on the outside of the SEM chamber. Most SEMs provide such a connector on the outside of the SEM chamber; this connector is normally capped with a metal cap to ensure proper grounding. Removing the metal cap and connecting the pico-ammeter will enable measuring the beam current. The pico-ammeter power needs to be provided by the same circuit as the SEM. When removing the pico-ammeter, make sure the metal cap is re-installed.

On some SEM systems there is a grounding cable from the stage attached to the inside of the SEM chamber to provide grounding of the specimen. In that case you have to ask the manufacturer or service engineer to provide an absorbed current feedthrough.

When the measurement circuit is installed, mount the PELCO® Faraday Cup on the specimen stage and position the aperture under the beam. Either use high magnification in scanning mode or switch to point mode to direct the beam into the aperture opening of the PELCO® Faraday Cup. Read the beam current using the absorbed current meter or pico-ammeter. Tune condenser settings to observe change of beam current. By switching from point to scan mode it is easy to derive the proportion of the beam which is backscattered from the surface: In point mode all of the beam is absorbed in the PELCO® Faraday Cup, while in scan mode imaging the surface of the Faraday cup, only part of the beam is absorbed.

## Maintenance and Cleaning

It is best to store the PELCO® Faraday Cup in a dry dust free environment such as a desiccator. When properly used, there should be no reason to clean the PELCO® Faraday Cup. Dust can be easily removed by using a duster with pressurized cleaning gas such as our Product No. 81710 GUST Easy Duster.

If the aperture opening surroundings get contaminated and charging occurs, the surface can be cleaned by using a suitable metal polish such as Product No 891-30 Pikal Liquid Polishing Emulsion, our Product No. 11620 Wooden Picks and a lint-free cloth such as Product No 812-14, Twill-Jean Cleaning Cloths. Afterwards sonicate the Faraday Cup in a 50/50 mixture of isopropanol/acetone (use fume hood) and let it dry in a dust free environment. After the cleaning procedure mount the PELCO® Faraday Cup before use. If the Faraday Cup is supplied on the mount, solvent cleaning will debond the cup. It will have to be reattached using Product No. 16053 PELCO® Conductive Graphite.

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Microscopy Products for Science and Industry

P.O. Box 492477, Redding, CA 96049-2477, U.S.A.

Telephone: 530-243-2200; 800-237-3528 (U.S.A. or Canada) • FAX: 530-243-3781

Email: sales@tedpella.com • Web Site: <http://www.tedpella.com>