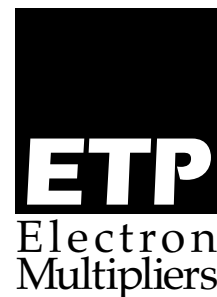


Maintenance, Storage and Handling of Active Film Multipliers™



Active Film Multipliers™ are being used by a growing number of people in mass spectrometry primarily because the higher performance offered by Active Film Multipliers is required to meet the modern detector demands of mass spectrometry. Active Film Multipliers have also attained a proven track record of reliability and performance across a wide range of mass spectrometry applications.

This article is a guide to the maintenance, storage and handling of Active Film Multipliers. The following procedures cover all aspects of multiplier care and maintenance, and will assist you in obtaining the best life and performance from your Active Film Multiplier.

1. Storage of Active Film Multipliers

The active dynode surfaces of an Active Film Multiplier are composed of a totally new stable-in-air material and can be repeatedly exposed to the air with no loss in performance.

The original packaging is designed for long term storage. The multiplier is delivered in two sealed plastic bags, the outer bag containing silica gel. If the multiplier is to be stored for long periods it is best left in its original packaging until required.

In its original packaging, the shelf life of the Active Film Multiplier is **guaranteed** for two years from ETP's shipping date.

If it is necessary to store the multiplier without its original packaging, it should be kept in a dust free, dry environment. Ideally it should be stored in a glass desiccator containing Silica Gel.



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2. Care and Handling of Active Film Multipliers

Handling of the multiplier should be carried out using normal high vacuum handling methods to keep the multiplier clean and free of contamination.

Powder-free gloves should be used to prevent finger-oils from contaminating the multiplier via direct contact with skin. All tools, mountings and equipment should be cleaned before coming into contact with the multiplier.

Care should be taken to minimize the exposure of the multiplier to airborne particles of dust or lint. Dust particles within the multiplier can cause increased background noise.

Exposure of the multiplier to a high humidity environment should be avoided, as it can cause noisy operation. In the event of this situation occurring, the multiplier can be restored by baking for 3 hours. In vacuum, the multiplier can be baked up to 350°C. At room ambient pressure, the baking temperature should be limited to 150°C. In either case, the multiplier should be heated and cooled slowly in the oven or vacuum chamber to avoid damage due to thermal shock.

The rugged design of the Active Film Multiplier greatly reduces the chance of damage through rough or careless handling. Nonetheless, an electron multiplier is a precision instrument and all reasonable care should be taken when handling.

3. Cleaning Active Film Multipliers

If the multiplier becomes contaminated with pump oil, it will be necessary to clean the multiplier to remove oil from the active surfaces. Do not to operate an oil contaminated multiplier until it has been cleaned using the procedures described below.

Operating a multiplier that is contaminated with oil can result in irreversible damage to the performance of the multiplier's active surfaces.

The recommended technique for cleaning an Active Film Multiplier requires the following equipment:

- i. ultra-sonic cleaner
- ii. glass beaker (properly cleaned)
- iii. Heptane (AR or HPLC grade)

Warning: Heptane is a volatile flammable solvent and appropriate care should be taken.

Method:

- i. Place multiplier in beaker and fill with Heptane until multiplier is fully immersed.
- ii. Place beaker in ultra-sonic cleaner and clean for approximately 10 minutes.
- iii. Dispose of used solvent in an appropriate manner and refill beaker with fresh Heptane. Place beaker in ultra-sonic cleaner and clean for approximately 10 minutes.
- iv. Repeat step iii.
- v. Allow to dry at room temperature. Precautions should be taken to keep the multiplier as free from dust as possible.
- vi. Bake multiplier for 3 hours at 120°C.

4. Installing and Operating Active Film Multipliers

Active Film Multipliers require no preconditioning. However, when an AF multiplier is first installed it is recommended that the applied high voltage be limited to 2200 volts for the first day of operation.

The multiplier leads should be positioned to have a minimum clearance of 3 millimetres between the lead and any metal parts of the multiplier mounting or vacuum chamber.

The multiplier should be mounted so that there are no sharp objects in close proximity to the multiplier aperture. Sharp objects near the aperture can become a source of noise.

Both the life and background noise characteristics of Active Film Multipliers are improved as the operating pressure is decreased.

CAUTION: An Active Film Multiplier should never be operated at pressures above 1×10^{-4} mbar. Operation of the multiplier above this pressure risks permanent damage to the multiplier performance as a result of gas discharge or arcing.

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5. Obtaining the Best Lifetime from Active Film Multipliers

The gain of a correctly installed multiplier will fall very gradually with time, requiring the applied high voltage to be increased periodically to restore multiplier performance. This is the normal aging process of the multiplier. The operating life obtained for the multiplier will vary between applications and is affected by a number of factors.

Factors influencing multiplier life are:

- the operating environment - lower operating pressure and lower partial pressure of hydrocarbons in the vacuum chamber will increase multiplier life.
- operating gain of the multiplier - operation with lower applied voltages (lower gain) will improve multiplier life.
- output current - lower average output currents drawn from the multiplier will improve multiplier life.

Rapid loss of multiplier performance can result from a failure in the vacuum pumping system resulting in either

- i. severe contamination of the multiplier by pump oils, or
- ii. arcing (or glow discharge) within the multiplier high voltage due to loss of high vacuum. Refer to section 3 for details of cleaning Active Film Multipliers after contamination by pump oils.

Loss of high vacuum while the multiplier's high voltage is on can result in arcing or glow discharge.



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