

# Beta Source Data Sheet

For Beta Attenuation Particulate Monitors



Met One Instruments, Inc.

## Overview

Met One Instruments Inc. airborne particulate monitors, including models BAM-1020 and E-BAM variations, contain a small Carbon 14 radioactive beta source with a maximum activity of 75 microcuries. The instruments are manufactured in compliance with U.S. NRC safety criteria listed in 10 CFR 32.27. This document is intended to provide information for particulate monitor customers, and to assist in the filing of any necessary foreign registrations for Met One products.

## Purpose and Reason for Radioactive Material

The beta attenuation method allows very accurate, near real-time measurement of airborne dust mass, without errors caused by variations in the particulate type or elemental composition. This beta attenuation principle has been in use for many decades in the manufacturing of paper and other materials, and has been adapted by various manufacturers of continuous particulate monitors worldwide. A complete description of the method is included in the BAM manuals.

## Licensure

Met One Instruments, Inc. is licensed with the state of Oregon to transfer, receive, possess, and use radioactive materials of the specified activity level. In addition, Met One holds an "Exempt-Distribution Material License" from the U.S. NRC which allows for the manufacture of aerosol detectors containing 75  $\mu\text{Ci}$  sources, and for the transfer of these instruments to persons who are exempt from the requirements for a license. The BAM-1020 and E-BAM units contain an "exempt quantity" of less than 100  $\mu\text{Ci}$  of Carbon 14 as defined in 10 CFR 30.71- Schedule B. As such, the purchaser is exempt from any regulatory requirements in the USA. This is a similar arrangement to that used for common household smoke alarms, which also usually contain a very small amount of radioactive material. Per regulation, an engraved metal tag identifying the source type and activity is permanently attached to each BAM instrument, but no radioactive hazard symbols are to be attached to the unit, due to the exempt quantity.

## Specifications

---

<b>Source Type:</b>	Sealed Source. Solid radionuclide material sealed within a metal capsule.
<b>Radionuclide:</b>	Carbon-14 ( $^{14}\text{C}$ ) in the form of Barium Carbonate ( $\text{BaCO}_3$ ).
<b>Half-Life of Nuclide:</b>	5730 Years.
<b>Nuclide Energy Spectrum:</b>	Nominal 50 KeV. Maximum 156 KeV (thousand electron-volts)
<b>Radiation Type:</b>	$\beta$ Beta electrons only. <u>Does not emit Alpha, Gamma, Neutron, or X-ray.</u>
<b>Rated Activity:</b>	60 $\mu\text{Ci}$ (microcuries). 2.22 MBq (mega Becquerel).
<b>Activity Tolerance:</b>	$\pm 15 \mu\text{Ci}$ . Maximum Activity 75 $\mu\text{Ci}$ . Below NRC exempt quantity of 100 $\mu\text{Ci}$ .
<b>Rated Shelf Life of Source:</b>	15 Years.
<b>Source Manufacturer:</b>	Eckert & Ziegler Nuclitec GmbH. Formerly QSA Global, AEA Technology.
<b>Max Roof Dose Rate:</b>	0 $\mu\text{Sv}$ (microsieverts) at roof. 0 $\mu\text{Sv}$ at 1.0 meter distance from unit.
<b>UN Transport Classification:</b>	UN2910.
<b>ISO-2919 Classification:</b>	C34242.
<b>U.S. Export Control Classification:</b>	EAR99
<b>State License:</b>	ORE-90941 Oregon Dept of Human Services, Public Health Division.
<b>Federal License:</b>	U.S. NRC Materials License 36-23875-01E.

---

## Photos and Diagrams



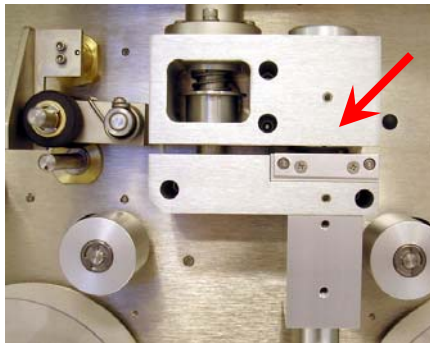
VZ-623 Sealed Beta Source



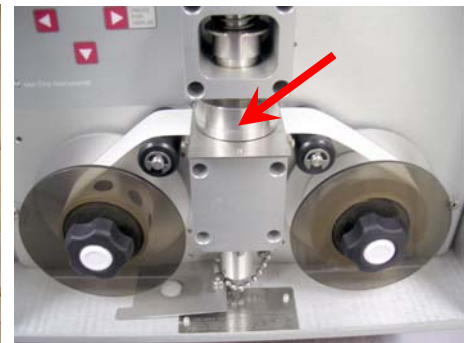
Instrument NRC Tag



BAM-1020



BAM-1020 Source Location



E-BAM Source Location

## Safety

The beta source is assembled into protective metal mountings in the BAM-1020 or E-BAM by factory technicians under a comprehensive set of safety procedures. The source is not directly accessed during any of the routine instrument field maintenance procedures. The instruments are designed to prevent the possibility of the beta source dislodging from the unit during a fall from height, vehicle crash, or other catastrophic event. No objects or tools (such as dental picks) should be inserted into the area of the source face which could gouge or scratch the metal foil surface. In no case should the beta source ever be removed from the unit except by trained factory technicians.

Due to the weak 156 KeV max energy of Carbon 14, the beta electrons penetrate only about 25 cm (10 inches) of air. As a result, any detection devices would need to be positioned immediately adjacent to the source face in order to detect any radiation. *Absolutely no detectable beta radiation is emitted from the instrument with the door closed.* The instrument has undergone safety evaluation as a condition of the U.S. NRC license. Because of this weak ability of Carbon 14 beta electrons to penetrate air or human tissue, and the lack of any accompanying gamma, health exposure risks are generally limited to direct inhalation or ingestion of the barium carbonate material.

In the USA and many other countries, the user is allowed to dispose of the BAM-1020 or E-BAM unit in normal trash disposal areas, just like a smoke alarm. However, Met One Instruments has a beta source recycling program which is recommended, especially in regions where simple disposal is not appropriate or allowed. In this case, the entire instrument must be returned to the factory for disposal. Contact Met One for details.



**Met One Instruments, Inc.**

1600 NW Washington Blvd • Grants Pass, Oregon 97526 • (541) 471-7111 • [www.metone.com](http://www.metone.com) • e-mail: [sales@metone.com](mailto:sales@metone.com)

Rev B Jan 2011