



Medical Imaging Sources

Product Information

Model: 3722.AD.010.M.N
Nuclide: Co-57
Activity: 10 mCi (370 MBq)
Ref. Date: 1-Mar-10
Serial No.: 1434-437



FeatherLite™
CO-57 FLOOD SOURCES



CAUTION RADIOACTIVE MATERIAL
SEE USE AND HANDLING
INSTRUCTIONS



Eckert & Ziegler
Isotope Products

CAUTION: This source contains radioactive material. It is to be used only by persons licensed to use radioactive material. It is to be stored in a lead container. It is to be disposed of in accordance with the requirements of the U.S. NRC or an Agreement State. See IFU for additional instructions, as applicable.

1-866-476-9767 • Valencia, CA 91355

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Eckert & Ziegler Isotope Products

Isotope Products Laboratories (IPL) was founded in 1967 by Karl Amlauer, a UCLA educated chemist and founding partner of US Nuclear Corp. Originally conceived to address the custom source needs of the aerospace and defense industries, IPL developed research sources, calibration standards and solutions, industrial sources, therapeutic sources, and medical reference sources. The company participated in the EPA Measurement Assurance Program and was one of the founding members of the NIST Measurement Assurance Program. The company grew slowly and steadily from its inception through the late 1990's.

In 1999, Isotope Products Laboratories was acquired by Eckert & Ziegler AG and eventually became Eckert & Ziegler Isotope Products (EZIP). A period of growth began with the acquisition of the radioactive source business of the DuPont Pharmaceuticals Company in 2001, cementing EZIP's position as a leader in the medical reference source business. The acquisition of The Source Incorporated in 2001 expanded EZIP's plated alpha and beta reference source line. EZIP acquired CNL Scientific Resources, a distributor of radionuclides, in 2004. Analytics Incorporated was acquired in 2005 providing access to the nuclear power marketplace.

Isotope Products Europe, a distributor of EZIP's products, was acquired in 2006. The radioactive source business of North American Scientific Inc. (NASI) was acquired in 2008 and Nuclitec-s.a.r.l, a subsidiary of QSA Global Inc., was acquired in 2009. The acquisitions that occurred between 2000 and 2009 allowed EZIP to expand its working capital, technology, customer base, and product base so that it now offers a complete portfolio of products to the entire radioactive source marketplace.

Through the tremendous growth of the last decade, EZIP has concentrated its efforts on production of high quality products delivered in a timely manner. EZIP's on-time delivery rate has consistently exceeded 95%. Its defect rate has been consistently lower than 0.5%. The same quality efforts and on-time delivery efforts have been fostered in all of EZIP's subsidiaries. This has allowed EZIP to enjoy fantastic customer satisfaction borne out through customer surveys and continuing growth in market share. EZIP continues to improve the production methods of many of its acquired products.

Recent improvements to the flood source production line have resulted in improved source uniformity as well as increased production capacity. EZIP has also introduced many innovations during this time including Perflexion™, the first flexible Flood Source, the IGG100 Gallium Generator, and Oil Well Logging sources capable of operating under pressures greater than 40,000 psi.

Throughout its history, Eckert & Ziegler Isotope Products has grown and improved. It continues to improve its products and services. It continues to grow organically and through acquisition. EZIP is dedicated to serving the marketplace with high value quality products safely constructed and delivered on time through a quality system founded on customer satisfaction, regulatory compliance, and continuous improvement.



Eckert & Ziegler
Isotope Products

General Information

Contact Information

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Phone: (661) 309-1010
Fax (Main): (661) 257-8303
nucmedsales@ezag.com
www.isotopeproducts.com

Licensing Requirements

It is company policy to require written verification of the customer's Agreement State or Nuclear Regulatory Commission (NRC) radioactive materials license for all items. No orders will be processed without a copy of the customer's license on file at Eckert and Ziegler Isotope Products (EZIP). Compliance with applicable local, state and federal regulations concerning procurement and possession of radioactive materials is the responsibility of the customer.

Exempt Quantities

Small amounts of some byproduct material may be purchased without a specific license per NRC regulations 10 CFR 30.18 and 10 CFR 30.71 Schedule B or the equivalent Agreement State regulations. Up to ten license exempt radioactive standards or sources may be shipped at one time. NRC regulations prohibit the further incorporation or use of license exempt sources in a manufactured device intended for further distribution. Contact the NRC or appropriate state agency for information on the use or possession of license exempt sources.

Quality System

EZIP maintains a comprehensive Quality System program based on a number of industry recognized standards and regulations ensuring the

production of consistently superior products.

EZIP's quality system is registered to ISO 9001/ISO 13845 and follows the regulations set forth in NRC Regulatory Guide 4.15 and 10 CFR 50 Appendix B, the required directive for the Nuclear Power Plants and their suppliers.

EZIP manufactures a wide range of nuclear medicine devices that bear the CE Mark. This indicates their conformity to the provisions of Council Directive 93/42/EEC Annex II.3 and enables them to be distributed freely within the European Community. EZIP's Authorized Representative is:

Eckert and Ziegler BEBIG GmbH
Robert-Rössle-Straße 10
D-13125 Berlin, Germany
www.bebig.de
Phone: + 49 (0) 30 94 10 84 - 0
Fax: + 49 (0) 30 94 10 84 - 240

EZIP's continued compliance to these quality related regulations is assured through a system of periodic audits performed by independent audit teams as well as trained EZIP personnel.

Product Changes

New product and method development is a continuous process at EZIP. Catalog specifications notwithstanding, we reserve the right to change production methods or fabrication techniques which do not diminish the performance of the product.

Availability

Since EZIP manufactures a large variety of products with many options, only a small inventory of

certain finished products is maintained. Please contact the Sales Department for more information regarding the availability of a certain product or nuclide.

Returns Policy

Due to the nature of our products, all sales are final and no items can be returned for credit unless the customer has demonstrated that the product does not meet specifications. Such a claim must be made within 30 days of receipt of order and the source returned within 60 days after receipt of the shipment.

NOTE: Before any return is made, EZIP MUST be notified so that a return authorization number can be assigned and proper shipping arrangements can be made. Shipments returned without a proper authorization number may be refused upon delivery.

Full credit will be given for sources that are found not to meet specifications as long as the source is returned to EZIP within the 60 day period mentioned above. EZIP will pay the return freight for the source, and the freight on the replacement.

Returns Policy (continued)

Sources reported and returned after the 60 day period will not be given credit, nor will EZIP pay for the return freight.

In the case that the customer ordered the incorrect part the following will apply:

The customer will have 30 days to request a replacement source. There will be a restocking fee charged for the original source. If the customer calls between 30 and 60 days, only 50% credit will be given for the original source.

After a 60 day period no credit will be given.

In the event that the sources are being returned from an overseas location, the shipment must be sent with Delivery Duty Paid (DDP) terms so that the customer is billed for all fees.

Nuclear Medicine Source Disposal Policy

Eckert and Ziegler Isotope Products (EZIP) will take back all nuclear medicine sources for disposal on a one-for-one basis. A source may be returned for disposal as long as the equivalent replacement source is purchased from EZIP at the time of the disposal request.

The customer will be required to pay all shipping costs for the return of the sources. In the event that the sources are being returned from an overseas location, the shipment must be sent with Delivery Duty Paid (DDP) terms so that the customer is billed for all fees.

Please note the customers will be charged for any unauthorized return, including freight.

Terms, Conditions and Warranty

Our payment terms are net 30 days from date of shipment, delays in mailing of invoice notwithstanding.

All payments are to be made in U.S. Dollars. A \$700 documentary collection handling charge will be assessed to all orders involving a documentary letter of credit or draft for collection. A \$50 handling fee will be charged for all orders involving prepayment via wire transfer of funds. All new accounts must submit banking information and three references for credit review. Please allow three days to verify your credit status.

See page 32 for complete terms and conditions.

Methods of Calibration

EZIP participates in the Radioactivity Measurement Assurance Program (MAP) conducted by the National Institute of Standards and Technology (NIST) in cooperation with NIST Radioactivity Measurement Assurance Program, Inc. (NRMAP, Inc.).

In this program, NIST provides blind samples which are assayed by EZIP, with the results sent to NIST. NIST then reports back to EZIP the difference between the NIST calibrated value and the EZIP calibrated value. In addition, EZIP routinely sends finished products to NIST for product verification and calibration. Over the years, EZIP has maintained a high degree of precision and

accuracy with NIST. Traceability is established and maintained through this cross-calibration process.

In addition to NIST traceability, EZIP is also accredited through DKD (a globally recognized calibration accreditation agency) to offer DKD accredited calibrations for a large number of radionuclides that EZIP regularly handles in its manufacturing facilities. Please contact customer service for availability of DKD accredited certification of your sources.

A calibration certificate is provided for each traceable source purchased from EZIP as either NIST or DKD. The certificate provides a statement of traceability, a complete description of the physical and nuclear characteristics of the source, a description of the method of calibration, and quantitative identification of the known and detected impurities. Activities are given in the Curie and SI systems. Most sources are manufactured to a precision of $\pm 15\%$ with respect to the customer's requested activity. NIST traceable sources typically have an accuracy of $\pm 5\%$ or better with respect to the certified measured value. Non-traceable (nominal) sources have an accuracy of $\pm 15\%$ with respect to the measured value and are supplied with a Nominal Source Data Sheet or Certificate which characterizes the source and its properties. EZIP uses half-lives listed in such nuclear reference standards as IAEA TECDOC-619. Please refer to your Certificate of Calibration or Nominal Source Data Sheet/Certificate for the appropriate nuclear data concerning your source.

Methods of Calibration (continued)

The total uncertainty associated with traceable sources, which is an estimate of the possible variance between the certified activity and the true activity, includes, but is not limited to, weighing uncertainty, random uncertainty, and systematic uncertainty. The quadratic combination of these uncertainties is generally <5% at the 99% confidence level ($k=2.58$) for NIST traceable sources and generally <4% at the 95% confidence level ($k=2$) for DKD accredited sources.

EZIP maintains a variety of state-of-the-art detector systems to calibrate sources and to check for impurities. Calibration equipment is checked daily using NIST traceable standards and their stability is further ensured by maintaining the instrumentation in a carefully controlled environment for temperature and humidity. All assay equipment and techniques are verified through MAP on an on-going basis.

Sources are either calibrated directly against NIST standards or by using NIST traceable assay equipment and techniques.

Definitions

Coefficient of Variation (CV)

A ratio of the standard deviation vs. the mean count, expressed as a percentage. This factor expresses the overall scattering of values from the average.

Integral Non-Uniformity (INU)

Measurement of the difference between the maximum count and the minimum count, expressed as a percentage. This factor is a measurement of the gap between the coldest and hottest points.

Differential Non-Uniformity (DNU)

Measurement of the largest extremes between two neighboring points; all of the neighboring points are compared, and the highest value is reported. This factor describes how uniform the transition is from one unit cell to the next unit cell.





Flood Sources





Flood Sources

The Eckert and Ziegler Isotope Products (EZIP) Co-57 Flood Source provides a uniform field of radiation for evaluation of Nuclear Medicine gamma camera performance, allowing detection and correction of any camera malfunction prior to diagnostic use. The typical useful life of the Co-57 flood source is approximately 2 years. The Co-57 flood sources are available in a variety of circular and rectangular dimensions, with activities to meet the standards established by the manufacturers of the gamma cameras.

Construction

EZIP's FeatherLite Co-57 flood sources consist of cobalt chloride uniformly dispersed onto a thin substrate which is then placed in an ABS encapsulation and ultrasonically welded. Perflexion flood sources consist of Co-57 uniformly dispersed in a polyurethane matrix within a flexible coated-fabric capsule.



FeatherLite™

FeatherLite weighs up to 60% less than other rigid flood sources. FeatherLite is even easier to handle, saving strain on your back. FeatherLite is now available for all popular cameras.

Quality

EZIP's manufacturing process ensures that Nuclear Medicine customers will receive the highest quality flood source available to perform quality control on gamma cameras.

Flood sources are scanned using a gamma camera. The camera images each flood source for parameters including differential and integral non-uniformity in accordance with ANSI N42.27. Visual checks are performed to detect any distortions of the active element and the outside capsule.

A leak test is performed on all sources prior to shipment.



C-Thru™

C-Thru's source holder is made of transparent, durable plastic. The radioactive area is clearly visible, enabling the C-Thru source to be easily positioned on the camera head.

Uniformity

EZIP's flood sources are manufactured according to the following specifications:

CV	≤ 1.0%
INU	≤ 3.6%

FLOOD SOURCES ARE AVAILABLE WITH AN OPTIONAL CASE. IF A CASE IS NOT REQUESTED, THE FLOOD SOURCE WILL BE SUPPLIED WITH A LEAD LINED CARDBOARD CONTAINER.



Perflexion™

The Perflexion flood source reduces bulk and weight with its unique flexible design and tungsten composite Wolfguard shield.

FeatherLite™

The lightest flood source

US Patent No. 6,787,786. Sealed Source and Device Registration No. CA0510S120S

Product Code	Active Dimensions		Overall Dimensions		Activity (mCi)	Activity (MBq)
MED3706	18.5" Diameter	470mm diameter	19" diameter	483mm diameter	5-20	185-740
MED3709	24.0" x 16.5"	610mm x 419mm	25.2" x 17.9"	683mm x 454mm	5-20	185-740
MED3722	10.9" x 10.9"	277mm x 277mm	11.9" x 11.9"	302mm x 302mm	5-20	185-740
MED3727	10.0" x 16.0"	254mm x 406mm	10.5" x 16.5"	267mm x 419mm	5-20	185-740

C-Thru™

The only transparent flood source

US Patent No. 7,172,799. Sealed Source and Device Registration No. MA-1059-S-359-S

Product Code	Active Dimensions		Overall Dimensions		Activity (mCi)	Activity (MBq)
CTRF10000 - 10003	24.4" x 16.5"	620mm x 420mm	27.5" x 21.2"	700mm x 538mm	5-20	185-740
CTRF10017-10019	16" x 10"	406mm x 254mm	17.5" x 14.5"	445mm x 368mm	5-20	185-740
CTRF10012	8.9" x 8.9"	226mm x 226mm	12.5" x 11.0"	318mm x 280mm	10	370
CTRF13770A *	15.2" x 9.1"	386mm x 231mm	15.7" x 9.8"	400mm x 250mm	10	370
CTRF10050-10053	18.5 diameter	470 mm diameter	21" diameter	534mm diameter	5-20	185-740

* Aluminum capsule, this is not a transparent flood source.

Perflexion™

The only flexible flood source

US Patent No. 7,233,012. Sealed Source and Device Registration No. CA0406S180S

Product Code	Active Dimensions		Overall Dimensions		Activity (mCi)	Activity (MBq)
PF16R	16" x 10.5"	406 mm x 266 mm	17.4" x 11.9"	442 mm x 302 mm	5-20	185-740
PF18C	18.5" diameter	470 mm diameter	20" diameter	508 mm diameter	5-20	185-740
PF24R	24" x 16.5"	610 mm x 419 mm	25.4" x 17.9"	645 mm x 454 mm	5-20	185-740

* Other sizes and activities available. Please contact EZIP for information.



Application Guide

Co-57 Flood Sources

Camera Manufacturer	Camera Model	SPECT or PLANAR	Source Type	Head Size	Recommended Nominal Activity	Perflexion™	Feather Lite™	NES	C-Thru™
Digirad	2020tc	SPECT	Square	8" x 8"	10mCi	PF09R-057-10M	MED3722	N/A	CTRF10012
	Spect PAK	SPECT	Square	9" x 9"	10mCi	PF09R-057-10M	MED3722	N/A	N/A
	Cardius / Ergo	SPECT	Square	8" x 6"	10mCi	N/A	MED3722	N/A	CTRF10012
Dilon	6800	SPECT	Rectangular	8" x 6"	5mCi	PF09R-057-5M	MED3722	N/A	CTRF10012
Elscent	SP4	SPECT	Circular	15.75"	10mCi Max	PF18C-057-10M	MED3706	NES392	CTRF10050
	SP6	SPECT	Rectangular	21.25" x 15.75"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Helix	SPECT	Rectangular	21.25" x 15.75"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Cardial	SPECT	Rectangular	15.75" x 10"	10mCi Max	PF16R-057-10M	MED3727	NES8510	CTRF10017
	Varicam	SPECT	Rectangular	21.25" x 15.75"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
GE Healthcare	300 AM	Planar	Circular	10"	3mCi	N/A	MED3700	NES298	N/A
	Maxi 2	Planar	Circular	15"	5mCi	PF18C-057-5M	MED3706	NES391	CTRF10051
	Maxi 37	Planar	Circular	15"	5mCi	PF18C-057-5M	MED3706	NES391	CTRF10051
	5000 Series	SPECT	Circular	24"	10mCi	N/A	MED3708	NES8012	N/A
	Discovery VH	SPECT	Rectangular	20" x 14"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Discovery 530c	SPECT	Rectangular	14.6" x 7.4"	10mCi	N/A	MED3743	N/A	N/A
	Hawkeye	SPECT	Rectangular	20" x 14"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	DSTi/Dsi	SPECT	Rectangular	12.99" x 14"	10mCi	N/A	MED3713	NES8480	N/A
	Maxxus	SPECT	Rectangular	21" x 16"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Starcam XRT	SPECT	Rectangular	21" x 16"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Starcam XCT	SPECT	Circular	15.4"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
	Starcam ACT	SPECT	Circular	15.4"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
	Optima	SPECT	Rectangular	14" x 9"	7.5mCi	PF16R-057-7.5M	MED3727	NES8507	CTRF10017
	Millenium MPS	SPECT	Square	14" x 14"	10mCi	N/A	MED3713	NES8480	N/A
	Millenium MPR, VG	SPECT	Rectangular	15.75" x 21.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Millenium MG	SPECT	Rectangular	14" x 20"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Neurocam	SPECT	Rectangular	7.9" x 6.7"	10mCi	PF09R-057-10M	MED3722	N/A	CTRF10012
	Myosight	SPECT	Rectangular	20" x 14"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Infinia	SPECT	Rectangular	21.25" x 15.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Ventri	SPECT	Rectangular	14.6" x 7.4"	10mCi	PF16R-057-10M	MED3727	NES8510	CTRF10017
IS ²	SR (Single Head Rect.)	SPECT	Rectangular	20" x 14.8"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Pulse CDC / DCC	SPECT	Rectangular	15" x 10.2"	10mCi	PF16R-057-10M	MED3727	NES8400	CTRF10017
	SC (Single Head Circ.)	SPECT	Circular	15"	10 mCi	PF18C-057-10M	MED3706	NES8510	CTRF10050
Mediso Medical	CardioSpect SC	SPECT	Rectangular	20.8" x 15.3"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	CardioSpect SR	SPECT	Rectangular	20.8" x 15.3"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	CardioSpect D90	SPECT	Rectangular	14.5" x 9"	10mCi	N/A	N/A	N/A	CTRF13770A
	CardioSpect VMAX	SPECT	Rectangular	20.8" x 15.3"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	NeuroSpect Quad	SPECT	Rectangular	9" x 8"	10mCi	N/A	N/A	N/A	CTRF13770A
Philips Healthcare	ARC 3000	Planar	Circular	15"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
	Genesys	SPECT	Rectangular	20" x 15"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000

Application Guide

Co-57 Flood Sources

Camera Manufacturer	Camera Model	SPECT or PLANAR	Source Type	Head Size	Recommended Nominal Activity	Perflexion™	Feather Lite™	NES	C-Thru™
Philips Healthcare	Brightview	SPECT	Rectangular	20.25" x 16"	10mCi Max	PF24RW-057-10M	N/A	NES8610	CTRF10021
	Argus	SPECT	Rectangular	20" x 15"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Solus, Cardial, or Vertex	SPECT	Rectangular	20" x 15"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Forte	SPECT	Rectangular	20 x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Cirrus	SPECT	Circular	15"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
	Cardio MD	SPECT	Rectangular	9.2" x 15.4"	10mCi Max	PF16R-057-10M	MED3727	NES8510	CTRF10017
	Cardio 60	SPECT	Rectangular	20" x 15"	10mCi Max	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Precedence	SPECT/CT	Rectangular	20" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Skylight	SPECT	Rectangular	20" x 14"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Dynamo	Planar	Circular	10"	3mCi	N/A	MED3700	NES297	N/A
Philips Healthcare	411	Planar	Circular	11"	5mCi	N/A	MED3700	NES297	N/A
	412	Planar	Circular	12"	5mCi	N/A	MED3700	NES297	N/A
	415	Planar	Circular	15"	5mCi	PF18C-057-5M	MED3706	NES391	CTRF10051
	Prism 1000	SPECT	Rectangular	20" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Prism 2000	SPECT	Rectangular	20 x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Prism 3000	SPECT	Rectangular	15.7" x 9.4"	10mCi	PF16R-057-10M	MED3727	NES8510	CTRF10017
	SX300	SPECT	Rectangular	14" x 14"	10mCi	N/A	MED3725	NES8480	N/A
	Axis / Irix	SPECT	Rectangular	21" x 15.5"	10mCi	PF24R-057-10M	MED3709	NES8400	N/A
	Multispect 2	SPECT	Square	21.25" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Multispect 3	SPECT	Rectangular	16" x 12"	10mCi	N/A	MED3713	NES8480	N/A
Siemens Medical Solutions	3700, 7500 Orbiter Series	SPECT	Circular	15.25"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
	Body Scan	SPECT	Rectangular	23.5" x 15.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Diacam	SPECT	Rectangular	21.25" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	3700, 7500 Orbiter Series	SPECT	Rectangular	21.25" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	c.cam	SPECT	Rectangular	14" x 8.4"	10mCi	PF16R-057-10M	MED3727	NES8510	CTRF10017
	Symbia	SPECT	Rectangular	21.23" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	e.cam	SPECT	Rectangular	21.25" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	DST	SPECT	Rectangular	11.7" x 15.8"	10mCi	N/A	MED3713	NES8480	N/A
	DSX	SPECT	Rectangular	21.3" x 15.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	DS7	SPECT	Circular	15.75"	10mCi	PF18C-057-10M	MED3706	NES392	CTRF10050
SMV (Sopha Medical)	Bodytrac	SPECT	Rectangular	21.3" x 15.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	DSTXL	SPECT	Rectangular	21.3" x 15.75"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	Vision FX Series	SPECT	Rectangular	20" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	GCA7100A & 7200	SPECT	Rectangular	21.5" x 19"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	GCA 9300	SPECT	Rectangular	16.1" x 8.3"	10mCi	PF16R-057-10M	MED3727	NES8510	CTRF10017
	GCA901, 901A	SPECT	Rectangular	20.1" x 14.5"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
Toshiba America	GCA901WB	SPECT	Rectangular	20.1" x 14.6"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000
	GCA602, 602A	SPECT	Circular	13.75"	5mCi	N/A	MED3700	NES297	N/A
	GCa601A	SPECT	Circular	13.75"	5mCi	N/A	MED3700	NES297	N/A
	t.cam	SPECT	Rectangular	21.25" x 15"	10mCi	PF24R-057-10M	MED3709	NES8400	CTRF10000

Accessories





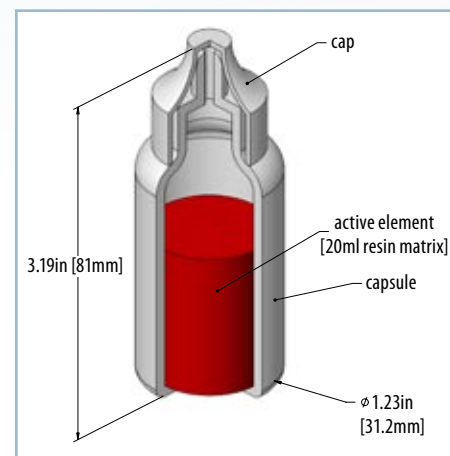
Accessories

Dose Calibrator Reference Standards (RV or E Vial) (SS&DR No. CA0406S148S)

Dose Calibrator Reference Sources provide a safe and convenient method of calibrating instruments for measuring the accuracy of imaging solutions most commonly utilized by medical technicians. The Dose Calibrator Vial is manufactured by distributing the active element in 20 mL of epoxy, comprising a density of approximately 1.0 g/cm³. Each standard is supplied in a 27 mL polyethylene vial. Calibration is in terms of activity contained in an aqueous solution. NIST traceable within $\pm 5\%$ at the 99% confidence level.

Product Code	Nuclide	Activity (mCi)	Activity(MBq)
RV-057-5M	Co-57	5	185
RV-057-10M	Co-57	10	370
RV-137-200U	Cs-137	0.200	7.4
RV-137-250U	Cs-137	0.250	9.25
RV-133-250U	Ba-133	0.250	9.25
RV-SET	Co-57, Cs-137, Ba-133	5, 0.200, 0.250	185, 7.4, 9.25
RV-SET-1	Co-57, Co-60, Cs-137, Ba-133	5, 0.050, 0.200, 0.250	185, 1.85, 7.4, 9.25
RV-SET-2	Co-57, Co-60, Cs-137	5, 0.050, 0.200	185, 1.85, 7.4
RV-060-50U	Co-60	0.050	1.85

Other nuclides, activities, and geometries are available upon request.



**Dose Calibrator
Reference Source**

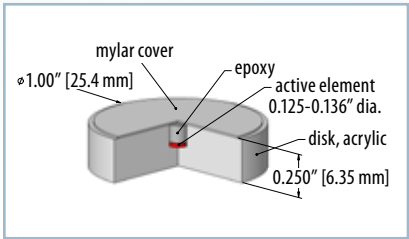


Spot Markers (SM-057)
(SS&DR No. CA0406S106S)

EZIP's Spot Markers are used for patient orientation during SPECT studies. A 0.136" (3.45 mm) diameter active area is marked with purple epoxy and centered in a 1" x 0.250" (25.4 mm x 6.35 mm) clear acrylic disk. Contained activity is supplied as a nominal value $\pm 15\%$.

Model Number	Nuclide	Activity (μCi)	Activity (MBq)
SM-057-25U	Co-57	25	0.925
SM-057-50U	Co-57	50	1.85
SM-057-100U	Co-57	100	3.7
SM-057-200U	Co-57	200	7.4

Other activities and nuclides are available upon request.



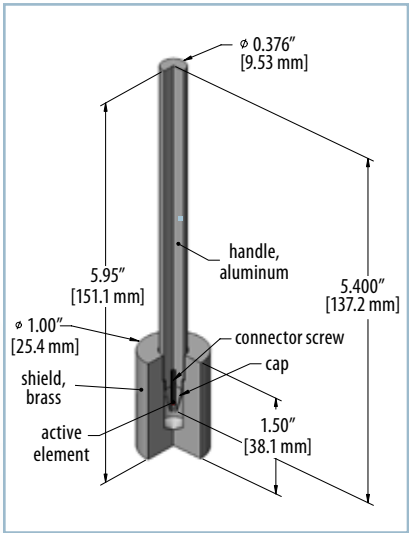
Spot Marker

Pen Point Markers (PP-057)
(SS&DR No. CA0406S173S)

The EZIP Pen Point Marker is used to mark a point or region of interest during SPECT studies. The Pen Point Marker contains Co-57 in a resin matrix at the end of a 5.4" (13.7 cm) anodized aluminum rod. The pen-shaped rod screws into a brass cap which shields the active point. The Pen Point Marker is used in tracing the outlines of anatomical features on a patient. The trace appears almost instantly on the image display. Contained activity is supplied as a nominal value $\pm 15\%$.

Model Number	Nuclide	Activity (μCi)	Activity (MBq)
PP-057-100U	Co-57	100	3.7
PP-057-200U	Co-57	200	7.4

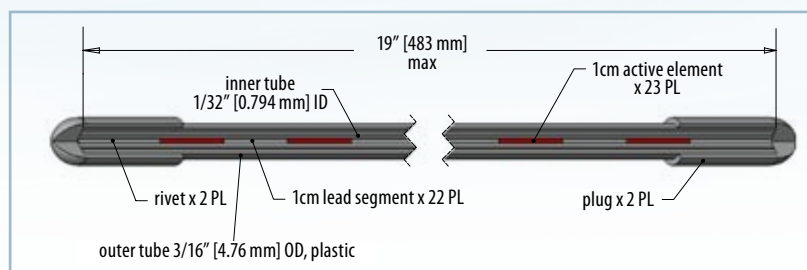
Other activities are available upon request.



Pen Point Marker

Flexible Rulers (FR-057) (SS&DR No. CA0406S171S)

Radioactive rulers and markers are used to define anatomical locations and/or organ size during a SPECT study. The Flexible Ruler is a plastic tube 0.19" (4.8 mm) in diameter containing 45 alternating 0.394" (10 mm) sections of Co-57 and inactive lead. The overall length of the ruler is 19" (48 cm) with an active length of 17.7" (45 cm). Contained activity is supplied as a nominal value $\pm 15\%$.



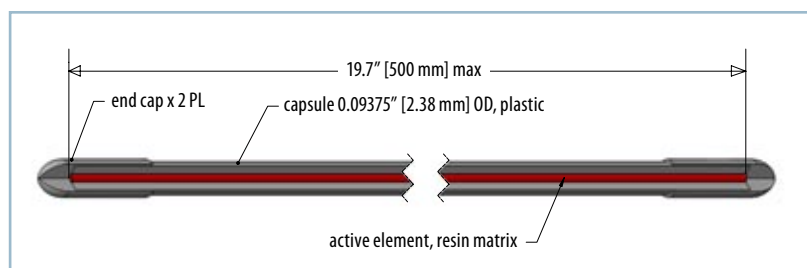
Flexible Ruler

Model Number	Nuclide	Activity (μCi)	Activity (MBq)
FR-057-460U	Co-57	460	17.02

Other activities are available upon request.

Flexible Markers (FM-057) (SS&DR No. CA0406S172S)

Co-57 uniformly dispersed in an epoxy matrix is injected into a 0.094" (2.4 mm) outer diameter flexible plastic tube having an inner diameter of 0.03" (0.79mm). The overall length is 19.7" (50 cm) and the active length of the ruler is 19.2" (48.7 cm). Contained activity is supplied as a nominal value $\pm 15\%$.



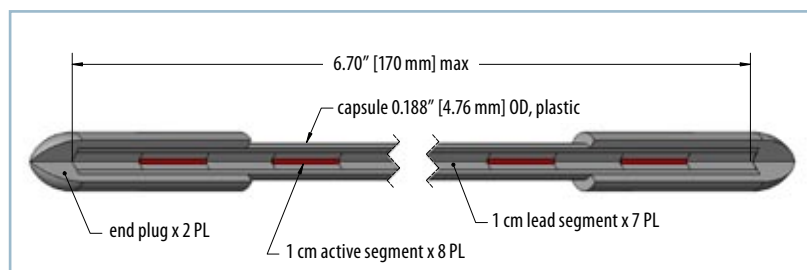
Flexible Marker

Model Number	Nuclide	Activity (μCi)	Activity (MBq)
FM-057-150U	Co-57	150	5.55

Other activities are available upon request.

Rigid Rulers (RR-057) (SS&DR No. CA0406S170S)

The Rigid Ruler is a plastic tube 0.197" (5 mm) in diameter containing 15 alternating 0.394" (10mm) sections of Co-57 and inactive lead. The overall length of the ruler is 6.7" (17 cm) with an active length of 5.91" (15 cm). Contained activity is supplied as a nominal value $\pm 15\%$.



Rigid Ruler

Model Number	Nuclide	Activity (μCi)	Activity (MBq)
RR-057-160U	Co-57	160	5.92

Other activities are available upon request.

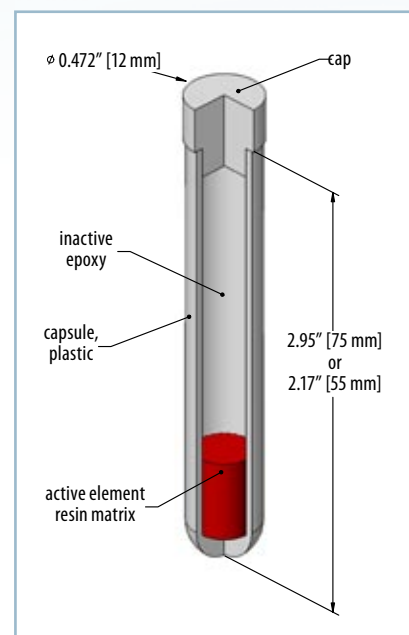
Gamma Tube Standards (SS&DR No. CA0406S149S)

Each source consists of a polypropylene test tube containing 0.75 mL of active epoxy with the balance of the test tube filled with cold epoxy. Each set contains Ba-133, Cs-137, Co-57, Co-60, Cd-109, Mn-54, and Na-22. Test tube sizes available: **T1**) 2.17" x 0.472" (55 mm x 12 mm) OR **T2**) 2.95" x 0.472" (75 mm x 12 mm) A variety of other nuclides and tube sizes are available upon request. Customer-supplied tubes can be utilized upon request. Tube sources are calibrated as NIST traceable with an accuracy of $\pm 5\%$ at the 99% confidence level.

Product Code	Activity (μCi)	Activity (kBq)
GF-290- (T1 or T2)	0.1 or 1.0	3.7 or 37

Other activities are available upon request.

Test tube standards may also be purchased individually.



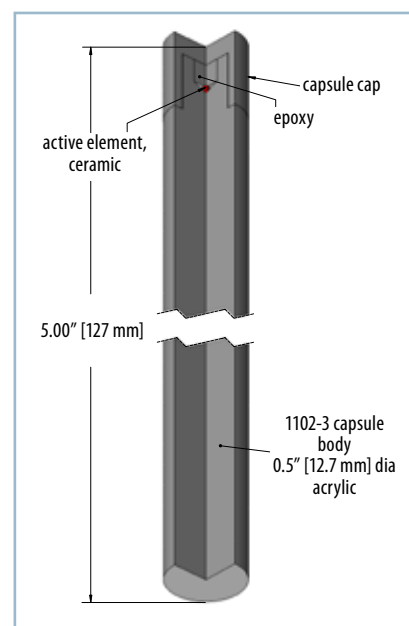
Gamma Tube Standards

Well Counter (Rod) Standards (SS&DR No. CA0406S107S)

Each source consists of a lucite rod measuring **R2**) 5" x 0.5" (127 mm x 12.7 mm) or **R3**) 2.95" x 0.5" (74.9 mm x 12.7 mm). The activity is located in a 0.187" x 0.187" (4.75 mm x 4.75 mm) well, positioned approximately 0.250" (6.35 mm) from the top of the rod. *Set includes Ba-133, Cs-137, Co-57, Co-60, Cd-109, Mn-54, and Na-22. Rod sources are calibrated as NIST traceable with an accuracy of $\pm 5\%$ at the 99% confidence level.

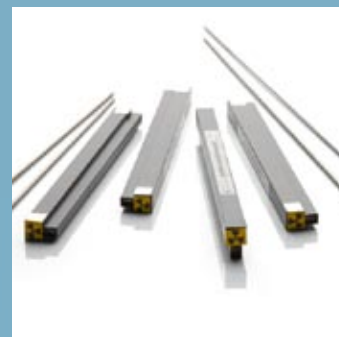
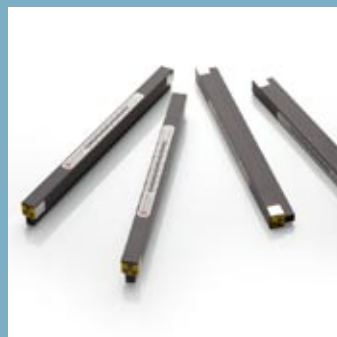
Product Code	Nuclide	Inches	mm	Activity (μCi)	Activity (kBq)
GF-0012	Co-57	2.95	74.9	0.1	3.7
GF-0208	Co-57	2.95	74.9	1	37
GF-0014	Cs-137	2.95	74.9	0.1	3.7
GF-0209	Cs-137	2.95	74.9	1	37
GF-0206	Cs-137	5	127	0.1	3.7
GF-0210	Co-57	5	127	1	37
GF-0207	Co-57	5	127	0.1	3.7
GF-0211	Cs-137	5	127	1	37
GF-290- (R2 or R3)	SET*	5	127	0.1 or 1.0	3.7 or 37
GF-0235	Ba-133	2.95	74.9	0.1	3.7
GF-0239	Ba-133	5	127	0.1	3.7

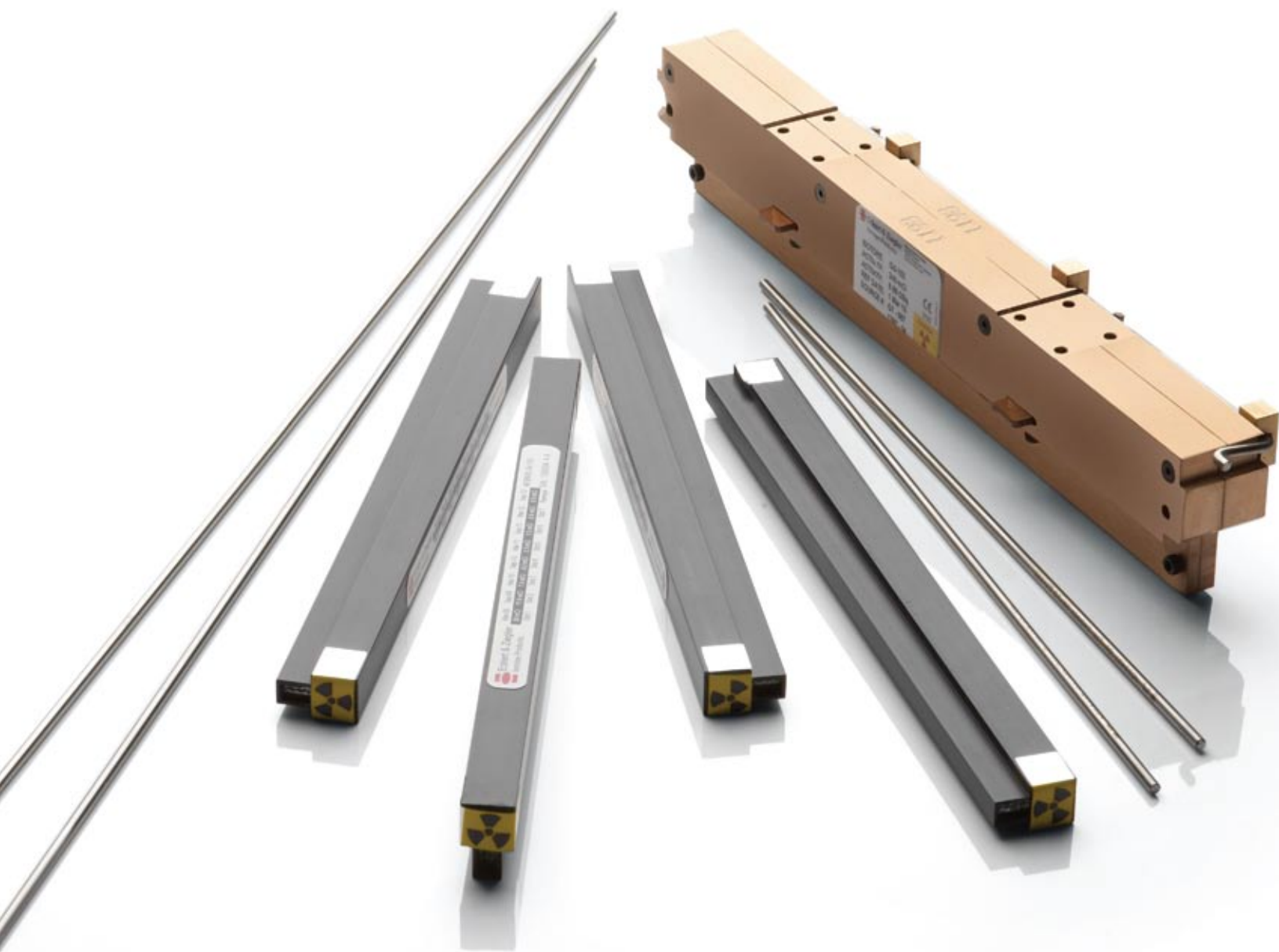
Other nuclides, activities and geometries are available upon request.



Well Counter Standards

Sources for SPECT





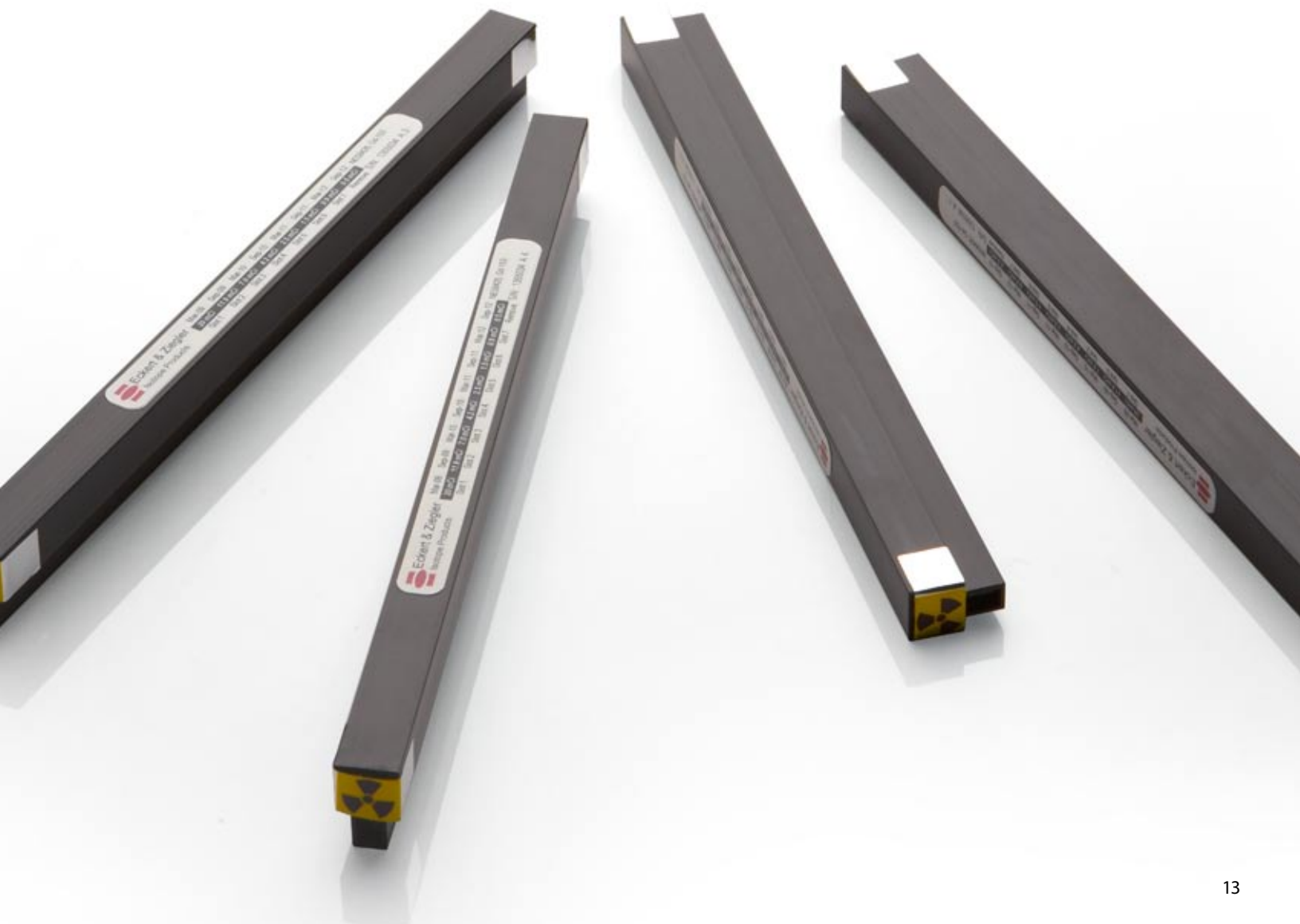
Sources for SPECT

EZIP manufactures a wide range of Attenuation Correction line sources for Single Photon Emission Computed Tomography (SPECT) studies.

A SPECT image is developed by measuring a collimated radiation beam emitted from a patient's body. The radiation beam is produced by injecting a known radiopharmaceutical into the patient.

SPECT image quality can suffer from unquantified attenuation effects caused as the beam passes through tissue of varying density and thickness. A line source is utilized to produce a "control beam" that is measured concurrently with the "radiopharmaceutical beam." The two beams are integrated and patient specific attenuation is calculated. The resulting image is of higher quality

than an image produced without attenuation correction. The typical nuclides used in Attenuation Sources for SPECT studies are Gd-153, Co-57 and Ba-133. Sources are singly or doubly encapsulated in both line and point geometries. The nuclides, activities and dimensions are manufactured in accordance to OEM Camera manufacturer specifications.



Application Guide

SPECT Sources

Camera Manufacturer	Camera Model	Product Code EZIP	Nuclide	Nominal Activity(mCi)	Nominal Activity(MBq)	SSDR	Sold As	System Requires	CE Marked Y/N	Application	Recommended Replacement
Siemens Medical Solutions	e.cam	NES8426-28	Gd-153	192	7.10 GBq	CA0406S204S	Set of 28	1	Y	*AC	NA
		NES8426-4	Gd-153	80	2.96 GBq	CA0406S204S	Set of 4	1	Y	*AC	6 months
	Symbia	HEGL-0133	Gd-153	10	370	CA0406S165S	Each	1	Y	QC	2 Years
		PHI-0124	Co-57	0.05	1.85	CA0406S118S	Each	1	Y	QC	1 Year
GE Healthcare	Millennium Myosight	NES8429-SET	Gd-153	450	16.6 GBq	CA0406S204S	Set of 2	1	Y	*AC	12-18 months
	SMV DST XLI	NES8424**	Gd-153	300	11.1 GBq	CA0406S204S	Each	2	Y	*AC	12-18 months
Phillips Healthcare	MCD Vertex	HEGL-0109	Ge-68	0.5	18.5	CA0406S154S	Each	1	Y	QC	1 Year
	Forte	NES8412	Gd-153	250	9.25 GBq	CA0406S204S	Each	2	Y	*AC	1 Year
		78410	Lead Pig				Each	3	Y		12-18 months
	CardioMD	NES8497	Gd-153	240	8.8 GBq	CA0406S204S	Each	2	Y	*AC	12-18 months
	Precedence	MMS07-153-100U	Gd-153	0.1	3.7	N/A	Each	6	Y	QC	12-18 months
	Brightview XCT	MMS07-153-100U	Gd-153	0.1	3.7	N/A	Each	6	Y	QC	12-18 months

*Attenuation Correction

**Customers must return holders for reload

Fillables:

We can convert your fillable phantom to a long-lived solid source! Contact your sales rep for more info.



Sources for PET





Sources for PET

EZIP is the leader in source manufacturing for Positron Emission Tomography (PET) studies. EZIP manufactures dedicated Ge-68 Transmission Sources and Quality Assurance Sources for major

PET camera makers such as GE Healthcare, Siemens Medical Solutions, Positron Corporation, and others. In addition, EZIP manufactures dedicated Cs-137 and Na-22 sources for dedicated PET cameras.

Custom Sources: EZIP can manufacture PET sources for custom needs. Please contact an EZIP Medical Imaging Customer Service Representative for additional information.



Application Guide

PET Sources

Camera Manufacturer	Camera Model	Product Code EZIP	Nuclide	Nominal Activity (mCi)	Nominal Activity (MBq)	SSDR	Sold As	System Requires	CE Marked Y/N	Application	Recommended Replacement
Siemens Medical	ECAT ACCEL	HEGL-0080-5M	Ge-68	5	185	CA0406S185S	Each	3	Y	Transmission	1 Year
Solutions		EG-0317-3.3M	Ge-68	3.3	122.1	CA0406S184S	Each	1	Y	QC	1 Year
	ECAT EXACT	HEGL-0080-4M	Ge-68	5	185	CA0406S185S	Each	3	Y	Transmission	1 Year
	HR+	EG-0317-3.3M	Ge-68	3.3	122.1	CA0406S184S	Each	1	Y	QC	1 Year
	ECAT EXACT	HEGL-0080-3M	Ge-68	3	111	CA0406S185S	Each	3	Y	Transmission	1 Year
	47	EG-0317-3.3M	Ge-68	3.3	122.1	CA0406S184S	Each	1	Y	QC	1 Year
	ECAT ART	HEGL-0080-1M	Ge-68	1	37	CA0406S185S	Each	1	Y	Detector Set-up	1 Year
		EG-0317-1.2M	Ge-68	1.2	44	CA0406S184S	Each	1	Y	QC	1 Year
		PHI-0089	Cs-137	15	555	CA0406S118S	Each	2	Y	Transmission	N/A
	Biograph Non-	HEGL-0080	Ge-68	1 - 1.2	37 - 44.4	CA0406S185S	Each	2	Y	Detector Set-up	1 Year
	Pico	EG-0317-1.2M	Ge-68	1.2	44	CA0406S184S	Each	1		QC	1 Year
	Biograph	HEGL-0080-1M	Ge-68	1	37	CA0406S185S	Each	2	Y	Detector Set-up	1 Year
	Pico	EG-0317-2M	Ge-68	2	74	CA0406S184S	Each	1	Y	QC	1 Year
	Biograph	HEGL-0080	Ge-68	1 - 1.2	37 - 44.4	CA0406S185S	Each	2	Y	Detector Set-up	1 Year
	True V	EG-0318	Ge-68	2 - 2.5	74 - 92.5	CA0406S184S	Each	1	Y	QC	1 Year
GE Healthcare	Discovery ST	HEGL-0132	Ge-68	1.49	55	CA0406S185S	Each	1	Y	Calibration	1 Year
	Discovery 690	HEGL-0139	Ge-68	0.5	18.5	CA0406S185S	Each	1	Y	Normalization	1 Year
		VQC-068	Ge-68	0.095	3.5	N/A	Each	1	Y	QC	1 Year
	Discovery 600	HEGL-0140	Ge-68	0.27	10	CA0406S185S	Each	1	Y	Normalization	1 Year
		VQC-068	Ge-68	0.095	3.5	N/A	Each	1	Y	QC	1 Year
	Discovery LS	HEGL-0020	Ge-68	1.62	60	CA0406S238S	Each	1	Y	Normalization	2 Years
		HEGL-0019	Ge-68	10.8	400	CA0406S238S	Each	2	Y	Transmission	6-9 months

Application Guide

PET Sources

Camera Manufacturer	Camera Model	Product Code EZIP	Nuclide	Nominal Activity (mCi)	Nominal Activity (MBq)	SSDR	Sold As	System Requires	CE Marked Y/N	Application	Recommended Replacement
Philips Healthcare	CPET	GF-0227	Na-22	0.1	3.7	CA0406S106S	Each	1	Y	QC	2 Years
		HEG-0096	Cs-137	5	185	CA0406S122S	Each	1	Y	Calibration	N/A
	Allegro	HEG-0111	Cs-137	20	740	CA0406S122S	Each	1	Y	*AC	N/A
		GF-0227	Na-22	0.1	3.7	CA0406S106S	Each	1	Y	Calibration	2 Years
	Gemini	GF-0227	Na-22	0.1	3.7	CA0406S106S	Each	1	Y	Calibration	2 Years
	GXL	MMS05-022-10U	Na-22	0.01	0.37	N/A	Each	6	Y	QC	2 Years
	Gemini	HEGL-0136	Na-22	0.1	3.7	N/A	Each	1	Y	QC	2 Years
	TF	MMS05-022-10U	Na-22	0.01	0.37	N/A	Each	6	Y	QC	2 Years
	Positron	HZL, HZLR	HEGL-0110	Ge-68	1 - 6	TX476S167S	Each	1	N	Transmission	1 year
		HZ, Auricle	HEGL-0130	Ge-68	1 - 6	TX476S167S	Each	1	N	Transmission	1 year

*Attenuation Correction

Fillables:

We can convert your fillable phantom to a long-lived solid source! Contact your sales rep for more info.





Multimodal Sources





Sources for Multimodal Imaging

Eckert & Ziegler Isotope Products offers a range of multimodal sources for hybrid PET/CT and SPECT/CT imaging. These sources can be used as fiducial markers to improve image coregistration in sequential scans with standalone scanners of different modalities, or for anatomical or position marking with visibility in both images of a hybrid scanner. CT targets in the clinical sources are designed to mimic cortical bone density with 120 kVp x-rays, and the MMS04 pre-clinical fiducial marker has an active element with density optimized for visibility at 50 kVp without artifacts. The new model MMS10 source even adds MRI visibility to the portfolio, as the only sealed-source fiducial marker available anywhere with visibility in three modalities. Have a specialized application? Many of these designs can be customized – contact a customer service representative to design your own fiducial marker.

Model MMS01 Specifications

Capsule: 1" x 0.25" (D x H)
white Delrin

Active dimensions: 1mm x 1mm
cylinder

Suggested usage:
High-resolution PET point source or
fiducial marker.

Model MMS02 Specifications

Capsule: 1" x 0.25" (D x H)
clear cast acrylic

Active dimensions:
1.5mm x 1.5mm cylinder

CT target: 1/4" OD bone-equivalent
ring (surrounds active element)

Suggested usage:
Multimodal fiducial marker for clinical
image coregistration.

Model MMS03 Specifications

Capsule: 1" x 0.25" (D x H)
clear cast acrylic with etched
crosshairs for laser alignment

Active dimensions: 1mm diameter
sphere

CT target: 2mm OD bone-equivalent
ring (surrounds active element)

Suggested usage:
Multimodal fiducial marker for
clinical image coregistration.

Model MMS04 Specifications

Capsule: 3 x 3 x 8mm
clear acrylic with Delrin plug

Active dimensions: 1 x 0.5mm
(D x H) cylinder

CT target: Active element is
CT-visible

Suggested usage:
Multimodal fiducial marker for
image coregistration, recommended
for small animal studies or other situations
where a small source capsule is needed.

Model MMS06 Specifications

Capsule: 1" x 0.25" (D x H)
clear cast acrylic

Active dimensions: 0.25mm
diameter sphere

Suggested usage:
High-resolution point source or spot
marker for use with scanners with
resolution better than 3mm.

Model MMS09 Specifications

Capsule: 1 x 1 x 1 cm cast acrylic
cube

Active dimensions: 0.25mm sphere
centered in capsule

Suggested usage:
NEMA NU4 resolution testing.

Model MMS10 Specifications

Capsule: 0.5" (12.7mm) dia x 0.23"
(5.8mm) thick cast acrylic

Active element: .315" (8mm) dia gel
with CT contrast MR/CT/radionuclide
trimodal fiducial marker

Suggested usage:
For clinical imaging only. Not recommended
for high-resolution preclinical
scanners.



Model MMS11 Specifications

Capsule: 0.157" (4mm) dia x 2.06" (52.3mm) long cast acrylic rod with threaded end

Active dimensions: 1mm dia x 0.5mm T

Nuclide: Na-22, 20 μ Ci (740 kBq)

Suggested usage:

Dedicated source for Siemens Inveon Scanner

Model MMS12 Specifications

Capsule: 1.75" OD x 2.36"L, polycarbonate hollow cylinder, with 4 imbedded point sources.

Active dimensions: 0.5mm dia x 1mm thick point, 4 places

Suggested usage:

Dedicated source for Siemens Inveon Scanner

Model MMS13 Specifications

Capsule: 1.75" OD x 2.36"L, polycarbonate hollow cylinder, with 4 imbedded point sources.

Active dimensions: 0.5mm dia x 1mm thick point, 4 places

Suggested usage:

Dedicated source for Siemens Inveon Scanner

Model MMS15 Specifications

Capsule: 0.63" OD x 1.49"L, polycarbonate hollow cylinder, with 4 imbedded point sources.

Active dimensions: 0.5mm dia x 1mm thick point 4 places

Suggested usage:

Dedicated source for Siemens Inveon Scanner



Pre-Clinical Imaging





Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 1 mCi
ACTIVITY: 37 MBq
REF DATE: 1 Mar 10
SOURCE #: 1332-89
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 1 mCi
ACTIVITY: 37 MBq
REF DATE: 1 Mar 10
SOURCE #: 1332-70
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 1 mCi
ACTIVITY: 37 MBq
REF DATE: 1 Mar 10
SOURCE #: 1332-70
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 500 µCi
ACTIVITY: 18.5 MBq
REF DATE: 1 Mar 10
SOURCE #: 1337-38
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 1 mCi
ACTIVITY: 37 MBq
REF DATE: 1 Mar 10
SOURCE #: 1332-89
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 1 mCi
ACTIVITY: 37 MBq
REF DATE: 1 Mar 10
SOURCE #: 1332-32
NOT FOR ARVC USE

Eckert & Ziegler
Isotope Products
Ga-68
ACTIVITY: 5 mCi
ACTIVITY: 185 MBq
REF DATE: 1 Mar 10
SOURCE #: 1337-40
NOT FOR ARVC USE

Pre-Clinical Imaging

Manufacturer	Camera Model	Product Code	Nuclide	Activity	SSDR	Overall Diameter	Active Diameter	Overall Length	Active Length	Encapsulation
Philips Healthcare	Mosaic	HEG-0116	Cs-137	10mCi (370 MBq)	CA0406S122S	0.315" (8mm)	0.122" (3.1mm)	0.315" (8mm)	0.122" (3.1mm)	Doubly encapsulated stainless steel
MicroPET	Focus	USM01	Ge-68	500 uCi (18.5 MBq)	CA0406S235S	0.134" (3.4mm)	0.039" (1mm)	2.25" (57mm)	1mm	Singly encapsulated stainless steel rod with magnetic handle
	Focus	USM02	Co-57	5 mCi (185 MBq)	CA0406S235S	0.134" (3.4mm)	0.039" (1mm)	2.25" (57mm)	1mm	Singly encapsulated aluminum rod with magnetic handle
Siemens Medical Solutions	Inveon	PHI-0119	Co-57	5 mCi (185 MBq)	CA0406S118S	0.079" (2mm)	0.039" (1mm)	0.394" (10mm)	0.079" (2mm)	Singly encapsulated stainless steel
Gamma Medica Ideas	LABPET 4	HEGL-0137	Ge-68	500 uCi (18.5 MBq)	CA0406S182S	0.12" (3.05mm)	0.062" (1.57mm)	1.74" (44mm)	1.61" (41mm)	Singly encapsulated stainless steel
	LABPET 8	HEGL-0138	Ge-68	1 mCi (37 MBq)	CA0406S182S	0.12" (3.05mm)	0.062" (1.57mm)	3.23" (82mm)	3.10" (79mm)	Singly encapsulated stainless steel
	LABPET 12	HEGL-0141	Ge-68	1.5 mCi (55.5 MBq)	CA0406S182 S	0.12" (3.05mm)	0.062" (1.57mm)	4.85" (123mm)	4.72" (120mm)	Singly encapsulated stainless steel
Cylinder Phantoms		UPET01	Ge-68	up to 10 mCi	CA0406S184S	4.13" (105mm)	3.94" (100mm)	4.33" (110mm)	3.94" (100mm)	Delrin
		UPET02	Ge-68	up to 10 mCi	CA0406S184S	2.56" (65mm)	2.36" (60mm)	4.33" (110mm)	3.94" (100mm)	Delrin
		UPET03	Ge-68	up to 10 mCi	CA0406S184S	4.13" (105mm)	3.94" (100mm)	6.10" (155mm)	5.71" (145mm)	Delrin
		UPET04	Co-57	up to 10 mCi	CA0406S184S	1.57" (40mm)	1.38" (35mm)	2.36" (60mm)	1.97" (50mm)	Delrin
		UPET05	Ge-68	up to 10 mCi	CA0406S184S	2.56" (65mm)	2.36" (60mm)	6.10" (155mm)	5.71" (145mm)	Delrin

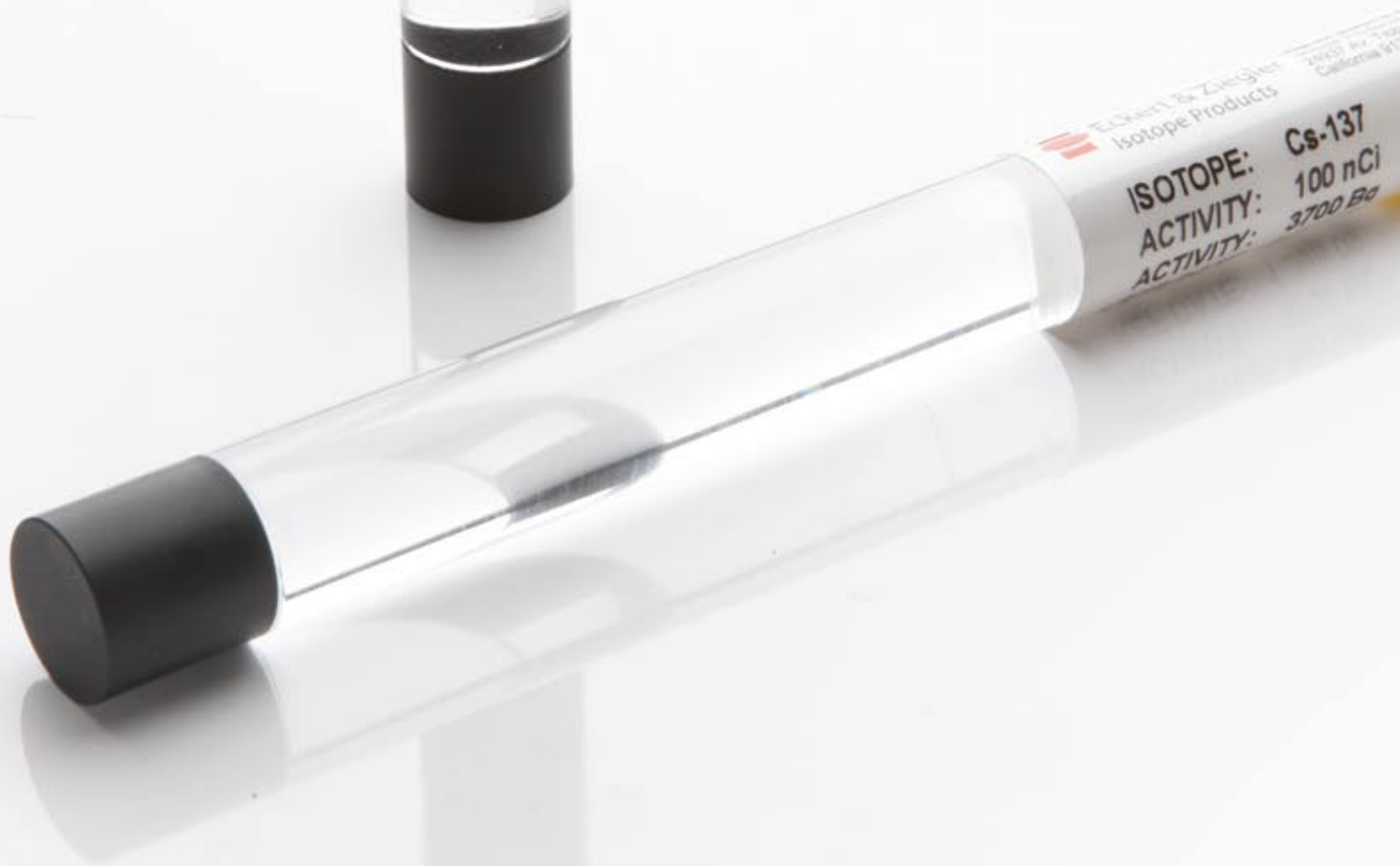
Fillables:

We can convert your fillable phantom to a long-lived solid source! Contact your sales rep for more info.





FAQ



FAQ

1. I don't know what flood source goes with a Siemens E-Cam?

EZIP has provided a camera cross reference sheet in this catalog, see page 7 & 8. This sheet will have both rigid and flexible flood source recommendations for every camera on the market. This sheet also has OEM recommended nominal activities.

2. I just bought a Co-57 100nCi rod source but I would like to dispose of a Cs-137 200uCi dose calibrator vial, can I do that?

No, the source that is returned must be the equivalent to the source that was just purchased. Please contact EZIP for additional disposal needs.

3. I don't see any prices in your catalog, how can I request a quote?

EZIP offers most of its product line through different dealers throughout the U.S. Please contact EZIP for dealer information.

4. I can't find what I am looking for in the catalog, are there other options available?

EZIP manufactures sources for different types of modalities and can customize almost any of its existing products. Please contact EZIP for pricing and availability on any custom source.

5. I have extra source(s) I want to return, can you take them back?

EZIP can take back most nuclear medicine sources / isotopes beyond the one for one disposal program for a cost. Please contact EZIP for additional information.

6. I just ordered a Perflexion™ flood source. Will the source crack, crease, flake, curl or tear over time?

No. The Perflexion's active element material was custom-formulated for EZIP, to meet the demands of years of use and abuse. You can fold, bend, crush, and pull this material without deforming or damaging the source, and it will not crease, crack, flake, or tear over time. In addition, the polymer "memory" ensures that the source will return to flatness even after being stored in a rolled configuration. EZIP has performed extensive fatigue testing on the polymer, and Perflexion shows excellent integrity and uniformity even after several working lives' worth of fatigue.

7. What is the difference between Contained and Apparent Activity? (Na-22, Ge-68 and Ba-133 RV Vials)

More than one instrument manufacturer produces pressurized reentrant ionization chambers (a.k.a. dose calibrator detectors). Due to slight differences in their construction, it is possible to obtain a range of recorded values when measuring the contained activity for an RV vial (a.k.a. dose calibrator vial). These recorded values are the numerical value obtained from the instrument's direct readout and are often referred to as the "apparent" activity of the source.

The true contained activity value for a radioactive source when measured in a pressurized reentrant ionization chamber is obtained by multiplying the apparent activity value (instrument display value) by the appropriate correction factor, a value typically within a few percent of unity, (i.e., 1). For a few radionuclides in the RV vial configuration, this correction factor is several percent or more different from unity, notably Na-22, Ge-68 and Ba-133. Therefore, additional information is provided on the calibration certificates for Na-22, Ge-68 and Ba-133. For these radionuclides, information regarding both the apparent and contained activity values is listed on the calibration certificates.

8. How can I convert Ci to Bq?

Ci units		Bq units
1 nCi	=	37 Bq
1 µCi	=	37 KBq
1 mCi	=	37 MBq
10 mCi	=	370 MBq

Additional questions should be addressed to EZIP Customer Service at 661-309-1010 Monday through Friday, 7:30 a.m. until 4:30 p.m. (Pacific Standard Time).



Decay Charts

Decay Chart Instructions

To determine the current radioactivity value for your source:

1. Calculate the number of days since the reference date for your source. *
2. Next, note the radionuclide in your source, and locate the Decay Chart for that nuclide.
3. Determine the remaining portion of radioactivity in the source, using the chart:
 - a. Select the number of days by adding the row and column numbers**
 - b. Read the fraction of radioactivity in the source at the intersection of the row and column
 - c. Multiply the source strength by the fraction to determine the remaining radioactivity in the source.

* Be sure to use the appropriate version of the Calendar Days chart based on whether a leap year is involved in the calculation (i.e., a February 29 has occurred). For example, if the current date is April 29, 2010 (119th day of the year based on the Calendar Days chart) and one has a source with a reference date of February 1, 2010 (32nd day of the year based on the same Calendar Days chart) there have been $119 - 32 = 87$ days of decay that have occurred. For sources that are multiple years old, you will need to take into account any leap years.

** For example, for 87 days, first select the 60 day row and follow it along to the 27 day column. This corresponds exactly to 87 days. The result is the fraction of radioactivity in the source. For numbers of days that do not correspond exactly to the number of days listed in the chart, choose the closest number of days.

Co-57

Half Life (d) = 271.79

Days	3	6	9	12	15	18	21	24	27	30
0	0.992	0.985	0.977	0.970	0.962	0.955	0.948	0.941	0.933	0.926
30	0.919	0.912	0.905	0.898	0.892	0.885	0.878	0.871	0.865	0.858
60	0.852	0.845	0.839	0.832	0.826	0.820	0.813	0.807	0.801	0.795
90	0.789	0.783	0.777	0.771	0.765	0.759	0.753	0.748	0.742	0.736
120	0.731	0.725	0.720	0.714	0.709	0.703	0.698	0.693	0.687	0.682
150	0.677	0.672	0.667	0.662	0.657	0.652	0.647	0.642	0.637	0.632
180	0.627	0.622	0.618	0.613	0.608	0.604	0.599	0.594	0.590	0.585
210	0.581	0.576	0.572	0.568	0.563	0.559	0.555	0.551	0.546	0.542
240	0.538	0.534	0.530	0.526	0.522	0.518	0.514	0.510	0.506	0.502
270	0.498	0.495	0.491	0.487	0.483	0.480	0.476	0.472	0.469	0.465
300	0.462	0.458	0.455	0.451	0.448	0.444	0.441	0.438	0.434	0.431
330	0.428	0.424	0.421	0.418	0.415	0.412	0.409	0.405	0.402	0.399
360	0.396	0.393	0.390	0.387	0.384	0.381	0.378	0.376	0.373	0.370
390	0.367	0.364	0.361	0.359	0.356	0.353	0.351	0.348	0.345	0.343
420	0.340	0.337	0.335	0.332	0.330	0.327	0.325	0.322	0.320	0.317
450	0.315	0.313	0.310	0.308	0.305	0.303	0.301	0.299	0.296	0.294
480	0.292	0.290	0.287	0.285	0.283	0.281	0.279	0.277	0.274	0.272
510	0.270	0.268	0.266	0.264	0.262	0.260	0.258	0.256	0.254	0.252
540	0.250	0.248	0.247	0.245	0.243	0.241	0.239	0.237	0.236	0.234

Ge-68

Half Life (d) = 270.8

Days	3	6	9	12	15	18	21	24	27	30
0	0.992	0.985	0.977	0.970	0.962	0.955	0.948	0.941	0.933	0.926
30	0.919	0.912	0.905	0.898	0.892	0.885	0.878	0.871	0.865	0.858
60	0.852	0.845	0.839	0.832	0.826	0.820	0.813	0.807	0.801	0.795
90	0.789	0.783	0.777	0.771	0.765	0.759	0.753	0.748	0.742	0.736
120	0.731	0.725	0.720	0.714	0.709	0.703	0.698	0.693	0.687	0.682
150	0.677	0.672	0.667	0.662	0.657	0.652	0.647	0.642	0.637	0.632
180	0.627	0.622	0.618	0.613	0.608	0.604	0.599	0.594	0.590	0.585
210	0.581	0.576	0.572	0.568	0.563	0.559	0.555	0.551	0.546	0.542
240	0.538	0.534	0.530	0.526	0.522	0.518	0.514	0.510	0.506	0.502
270	0.498	0.495	0.491	0.487	0.483	0.480	0.476	0.472	0.469	0.465
300	0.462	0.458	0.455	0.451	0.448	0.444	0.441	0.438	0.434	0.431
330	0.428	0.424	0.421	0.418	0.415	0.412	0.409	0.405	0.402	0.399
360	0.396	0.393	0.390	0.387	0.384	0.381	0.378	0.376	0.373	0.370
390	0.367	0.364	0.361	0.359	0.356	0.353	0.351	0.348	0.345	0.343
420	0.340	0.337	0.335	0.332	0.330	0.327	0.325	0.322	0.320	0.317
450	0.315	0.313	0.310	0.308	0.305	0.303	0.301	0.299	0.296	0.294
480	0.292	0.290	0.287	0.285	0.283	0.281	0.279	0.277	0.274	0.272
510	0.270	0.268	0.266	0.264	0.262	0.260	0.258	0.256	0.254	0.252
540	0.250	0.248	0.247	0.245	0.243	0.241	0.239	0.237	0.236	0.234

Gd-153

Half Life (d) = 242

Days	3	6	9	12	15	18	21	24	27	30
0	0.992	0.985	0.977	0.970	0.962	0.955	0.948	0.941	0.933	0.926
30	0.919	0.912	0.905	0.898	0.892	0.885	0.878	0.871	0.865	0.858
60	0.852	0.845	0.839	0.832	0.826	0.820	0.813	0.807	0.801	0.795
90	0.789	0.783	0.777	0.771	0.765	0.759	0.753	0.748	0.742	0.736
120	0.731	0.725	0.720	0.714	0.709	0.703	0.698	0.693	0.687	0.682
150	0.677	0.672	0.667	0.662	0.657	0.652	0.647	0.642	0.637	0.632
180	0.627	0.622	0.618	0.613	0.608	0.604	0.599	0.594	0.590	0.585
210	0.581	0.576	0.572	0.568	0.563	0.559	0.555	0.551	0.546	0.542
240	0.538	0.534	0.530	0.526	0.522	0.518	0.514	0.510	0.506	0.502
270	0.498	0.495	0.491	0.487	0.483	0.480	0.476	0.472	0.469	0.465
300	0.462	0.458	0.455	0.451	0.448	0.444	0.441	0.438	0.434	0.431
330	0.428	0.424	0.421	0.418	0.415	0.412	0.409	0.405	0.402	0.399
360	0.396	0.393	0.390	0.387	0.384	0.381	0.378	0.376	0.373	0.370
390	0.367	0.364	0.361	0.359	0.356	0.353	0.351	0.348	0.345	0.343
420	0.340	0.337	0.335	0.332	0.330	0.327	0.325	0.322	0.320	0.317
450	0.315	0.313	0.310	0.308	0.305	0.303	0.301	0.299	0.296	0.294
480	0.292	0.290	0.287	0.285	0.283	0.281	0.279	0.277	0.274	0.272
510	0.270	0.268	0.266	0.264	0.262	0.260	0.258	0.256	0.254	0.252
540	0.250	0.248	0.247	0.245	0.243	0.241	0.239	0.237	0.236	0.234

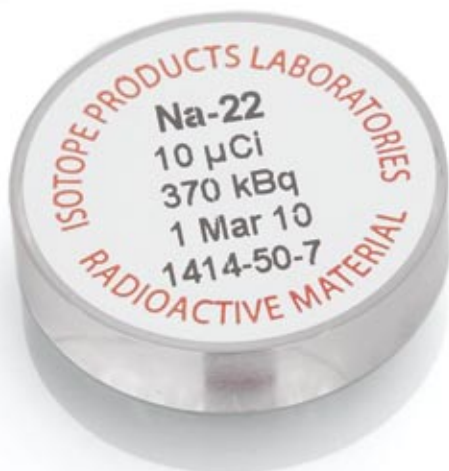
Decay Calendar

Non-Leap Year

Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	60	91	121	152	182	213	244	274	305	335
2	2	33	61	92	122	153	183	214	245	275	306	336
3	3	34	62	93	123	154	184	215	246	276	307	337
4	4	35	63	94	124	155	185	216	247	277	308	338
5	5	36	64	95	125	156	186	217	248	278	309	339
6	6	37	65	96	126	157	187	218	249	279	310	340
7	7	38	66	97	127	158	188	219	250	280	311	341
8	8	39	67	98	128	159	189	220	251	281	312	342
9	9	40	68	99	129	160	190	221	252	282	313	343
10	10	41	69	100	130	161	191	222	253	283	314	344
11	11	42	70	101	131	162	192	223	254	284	315	345
12	12	43	71	102	132	163	193	224	255	285	316	346
13	13	44	72	103	133	164	194	225	256	286	317	347
14	14	45	73	104	134	165	195	226	257	287	318	348
15	15	46	74	105	135	166	196	227	258	288	319	349
16	16	47	75	106	136	167	197	228	259	289	320	350
17	17	48	76	107	137	168	198	229	260	290	321	351
18	18	49	77	108	138	169	199	230	261	291	322	352
19	19	50	78	109	139	170	200	231	262	292	323	353
20	20	51	79	110	140	171	201	232	263	293	324	354
21	21	52	80	111	141	172	202	233	264	294	325	355
22	22	53	81	112	142	173	203	234	265	295	326	356
23	23	54	82	113	143	174	204	235	266	296	327	357
24	24	55	83	114	144	175	205	236	267	297	328	358
25	25	56	84	115	145	176	206	237	268	298	329	359
26	26	57	85	116	146	177	207	238	269	299	330	360
27	27	58	86	117	147	178	208	239	270	300	331	361
28	28	59	87	118	148	179	209	240	271	301	332	362
29	29		88	119	149	180	210	241	272	302	333	363
30	30		89	120	150	181	211	242	273	303	334	364
31	31		90		151		212	243		304		365

Leap Year

Days	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	32	61	92	122	153	183	214	245	275	306	336
2	2	33	62	93	123	154	184	215	246	276	307	337
3	3	34	63	94	124	155	185	216	247	277	308	338
4	4	35	64	95	125	156	186	217	248	278	309	339
5	5	36	65	96	126	157	187	218	249	279	310	340
6	6	37	66	97	127	158	188	219	250	280	311	341
7	7	38	67	98	128	159	189	220	251	281	312	342
8	8	39	68	99	129	160	190	221	252	282	313	343
9	9	40	69	100	130	161	191	222	253	283	314	344
10	10	41	70	101	131	162	192	223	254	284	315	345
11	11	42	71	102	132	163	193	224	255	285	316	346
12	12	43	72	103	133	164	194	225	256	286	317	347
13	13	44	73	104	134	165	195	226	257	287	318	348
14	14	45	74	105	135	166	196	227	258	288	319	349
15	15	46	75	106	136	167	197	228	259	289	320	350
16	16	47	76	107	137	168	198	229	260	290	321	351
17	17	48	77	108	138	169	199	230	261	291	322	352
18	18	49	78	109	139	170	200	231	262	292	323	353
19	19	50	79	110	140	171	201	232	263	293	324	354
20	20	51	80	111	141	172	202	233	264	294	325	355
21	21	52	81	112	142	173	203	234	265	295	326	356
22	22	53	82	113	143	174	204	235	266	296	327	357
23	23	54	83	114	144	175	205	236	267	297	328	358
24	24	55	84	115	145	176	206	237	268	298	329	359
25	25	56	85	116	146	177	207	238	269	299	330	360
26	26	57	86	117	147	178	208	239	270	300	331	361
27	27	58	87	118	148	179	209	240	271	301	332	362
28	28	59	88	119	149	180	210	241	272	302	333	363
29	29	60	89	120	150	181	211	242	273	303	334	364
30	30		90	121	151	182	212	243	274	304	335	365
31	31		91		152		213	244		305		366



Shipping And Terms



Shipping And Terms

Packaging and shipment of radioactive materials at Eckert and Ziegler Isotope Products (EZIP) adhere to the regulations of the U.S. Department of Transportation (DOT) per 49 CFR, the International Civil Aviation Organization (ICAO) and the International Air Transportation Association (IATA).

EZIP uses two types of packaging to ship radioactive materials: Excepted Packaging and Type A packaging.

Type A packaging is used to carry normal form radioactive material as defined by the A_2 values of 49 CFR 173.435 (2009) and IATA 10.3.2.1 (2010) and encapsulated radioactive material that has been issued an IAEA certificate of Competent Authority, Special Form Radioactive Materials Certificate, by the U.S. DOT.

In the Standard Type A configuration, sources are sealed in an inner container and centered in a fiberboard box. Sources requiring heavy shielding are shipped in a lead shielded container and centered in a fiberboard box.

Excepted Packaging (Limited Quantity) is used when the activity limits do not exceed those defined in 49 CFR 173.425 (2009) and IATA regulations table 10.3.D (2010) and the radiation level at any point on the package does not exceed 0.5 millirem per hour. All boxes shipped from EZIP as "Excepted Packages" meet the requirements of 49 CFR 173.421(2009) and IATA regulation 10.3.11.1 (2010).

Radiation levels on the external surfaces of all packages and at a distance of one meter from all external surfaces (Transport Index), will not exceed the limits set in 49 CFR 173.441(2009) or IATA 10.5.14.1 (2010). All measurements are made

with an Eberline RO20 or equivalent survey instrument.

Unless special arrangements are made with the customer in advance, radiation levels at the surface of any shielded inner containers will not exceed 200 millirem per hour as measured with an Eberline RO20 or equivalent survey instrument.

ANSI/ISO Classifications

The development of these standards began in 1962 and they were published in 1968. The standards were written so that both the regulatory agencies and the users would have specifications which would characterize radioactive sources and establish performance standards.

The table on the following page is from ISO 2919:1999, Classification of sealed source performance

Current copies of these standards are available from:

American National Standards Institute
25 West 43rd Street, 4th Floor
New York, NY 10036
(212) 642-4900
www.ansi.org

IHS
15 Inverness Way East
Englewood CO 80112
(800) 854-7179
www.global.ihs.com

International Organization for Standardization
1, ch. de la Voie-Creuse
Case Postale 56
CH-1211 Geneva 20
Switzerland
+41 22 749 01 11
www.iso.org



ANSI/ISO Classifications

Test	Class						
	1	2	3	4	5	6	X
Temperature	No Test	-40°C (20 min) +80°C (1 h)	-40°C (20 min) +180°C (1 h)	-40°C (20 min) +400°C (1 h) and thermal shock to 20°C	-40°C (20 min) +600°C (1 h) and thermal shock to 20°C	-40°C (20 min) +800°C (1 h) and thermal shock to 20°C	Special Test
External Pressure	No Test	25 kPa absolute to atmospheric	25 kPa absolute to 2 MPa absolute	25 kPa absolute to 7 MPa absolute	25 kPa absolute to 70 MPa absolute	25 kPa absolute to 170 MPa absolute	Special Test
Impact	No Test	50 g from 1 m or equivalent imparted energy	200 g from 1 m or equivalent imparted energy	2 kg from 1 m or equivalent imparted energy	5 kg from 1 m or equivalent imparted energy	20 kg from 1 m or equivalent imparted energy	Special Test
Vibration	No Test	3 times 10 min 25 to 500 Hz at 49 m/s ² (5 g _n) ¹⁾	3 times 10 min 25 to 50 Hz at 49 m/s ² (5 g _n) ¹⁾ and 50 to 90 Hz at 0.635 mm amplitude peak to peak and 90 to 500 Hz at 98 m/s ² (10 g _n) ¹⁾	3 times 30 min 25 to 80 Hz at 1.5 mm amplitude peak to peak and 80 to 2000 Hz at 196 m/s ² (20 g _n) ¹⁾	Not Used	Not Used	Special Test
Puncture	No Test	1 g from 1 m or equivalent imparted energy	10 g from 1 m or equivalent imparted energy	50 g from 1 m or equivalent imparted energy	300 g from 1 m or equivalent imparted energy	1 kg from 1 m or equivalent imparted energy	Special Test

1) Acceleration maximum amplitude

The tests are performed on two sources. Different specimens of the same source design are allowed for each test in the above table. To pass a test the sealed source must retain its activity after each test and pass the prescribed leak tests. The classification of the sealed source type shall be designated by the code ISO/, followed by two digits to indicate the year of approval of the standard used to determine the classification, followed by a solidus (/), followed by a letter, followed by five digits and a set of parenthesis containing one or more digits. The letter will be either C or E. C indicates the activity does not exceed limits established by nuclide dependent upon its toxicity and the solubility of its physical form. E indicates the activity exceeds those limits. The five digits indicate, respectively, the highest test passed for temperature, pressure, impact, vibration, and puncture.

Sealed Source Usage		Sealed Source Class, Temperature	Test And Class Pressure	Impact	Vibration	Puncture
Radiography - Industrial	Sealed source	4	3	5	1	5
	Source in device	4	3	3	1	3
Medical	Radiography	3	2	3	1	2
	Gamma Teletherapy	5	3	5	2	4
Gamma Gauges (medium and high energy)	Unprotected source	4	3	3	3	3
	Source in device	4	3	2	3	2
Beta gauges and sources for low energy gamma gauges or X-ray fluorescence analysis (excluding gas filled sources)		3	3	2	2	2
Oil well logging		5	6	5	2	2
Portable moisture and density gauge (including hand held dolly transported)		4	3	3	3	3
General neutron source application (excluding reactor start-up)		4	3	3	2	3
Calibration sources - Activity greater than 1 MBq		2	2	2	1	2
Gamma Irradiators ¹	Categories II, III, IV	5	3	4	2	4
	Category I	4	3	3	2	3
	(excluding gas-filled sources)					
Ion Generators ²	Chromatography	3	2	2	1	1
	Static eliminators	2	2	2	2	2
	Smoke detectors	3	2	2	2	2

¹For the purposes of this Standard, gamma irradiators have been divided into four distinct categories.

Category I—Self-Contained-Dry Source Storage Category II—Panoramic-Dry Source Storage

Category III—Self-Contained-Wet Source Storage Category IV—Panoramic-Wet Source Storage

²Source in device holder or assembly may be tested.

Terms And Conditions

1. DEFINITIONS

A. The word "goods" as used herein means products offered or acknowledged in this catalog, ordered by Buyer and furnished by Seller.

B. The word "services" means testing and other services offered or acknowledged in this catalog, ordered by Buyer and provided by Seller.

2. GENERAL

The terms and conditions set forth herein shall exclusively govern the sale of goods by Seller to Buyer and the furnishing of services by Seller to Buyer. Acceptance of an offer or of the goods or services furnished under quotations or acknowledgements is expressly limited to the terms and conditions contained herein. Any terms and conditions stated by Buyer in any purchase order or other document accepting or ordering such goods or services containing statements, clauses, terms or conditions modifying, adding to, repugnant to, or inconsistent with the terms and conditions of Seller herein contained, may only be deemed accepted by Seller if so stated in writing by a duly authorized signatory of Seller. Buyer further expressly agrees that such terms accepted by Seller are accepted only upon the condition and with the express understanding that, notwithstanding any statements, clauses, terms or conditions contained on any forms of Buyer, the liabilities of Seller shall be determined solely by the terms and conditions stated herein. Acceptance by Buyer of any goods offered for sale or services performed by Seller is expressly limited to the terms and conditions contained herein herein, and acceptance by

Seller of Buyer's performance which is inconsistent with any term or condition herein shall constitute a waiver as to said term or condition only.

3. PRICES

All prices quoted are in U.S. dollars, F.O.B. Burbank, California and/or Valencia, California. Quoted prices do not include charges for shipping, handling, insurance and hazardous materials documentation. State, use, consumption, and excise taxes payable or collectable by Seller in connection with its sales shall be in addition to invoice prices. Buyer will reimburse Seller for same at the time of payment of the invoice, whether or not such taxes are separately stated on the invoice. If the Buyer claims exemption from any of these taxes, Buyer shall promptly furnish satisfactory proof of such exemption and shall indemnify and hold Seller harmless from any loss or damage, including attorneys' fees, Seller incurs in the event any taxing authority finds that Seller should have collected tax.

4. DELIVERY

All delivery dates are estimated as accurately as possible; however, Seller shall not be liable for any loss, damage or delay, which is unavoidable or beyond Seller's control, including but not limited to delays caused or occasioned by acts of God, fire, strikes, insurrection, riot, accident, embargo, delay of carrier, act of civil or military authority, failure of a supplier to make timely delivery, the requirements of any statute, order or directive of any governmental authority. If delays from any such cause occur, the delivery time is correspondingly extended.

5. TITLE AND RISK OF LOSS

Title to and risk of loss of goods shall pass to the Buyer upon delivery to carrier even if transportation costs are prepaid by the Seller.

6. PAYMENT TERMS

Payment shall be due 30 days from date of invoice. If Buyer requests Seller to hold goods for delivery later than scheduled, the invoice shall bear the scheduled delivery date and payment shall be due 30 days from the scheduled delivery date. Buyer bears all risk of loss or damage while such goods are in Seller's possession and shall pay all reasonable charges for goods held for more than two months and shall reimburse Seller for all use or personal property taxes levied on held goods at any time while in Seller's possession. Seller shall have the right to modify, change or withdraw credit at any time and without notice. If in Seller's judgment the financial responsibility of Buyer becomes impaired or unsatisfactory, or if Buyer defaults under any contract with Seller, Seller may demand and Buyer shall give advance cash payment or satisfactory security and Seller may withhold shipments until such payment or security is received. Buyer expressly waives any right of set-off and shall make no deductions from payments due hereunder or for any damages of any type claimed by Buyer against Seller.

7. LIMITED WARRANTY

Seller warrants its goods to be of the quality described in its current catalogs or specifications delivered by Seller to Buyer as of the date of shipment. Seller warrants that catalog goods modified in accordance with

Buyer's specifications and non-catalog goods manufactured to Buyer's specifications will be free from defects in materials and workmanship and manufactured in conformity with specifications furnished to Seller by Buyer as of the date of shipment or specifications delivered by Seller to Buyer as of the date of shipment. Seller warrants its services to be of a workmanlike quality. SELLER MAKES NO OTHER WARRANTY. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, GUARANTIES, OBLIGATIONS OR LIABILITIES WHICH MAY BE EXPRESSED OR IMPLIED BY SELLER OR ITS REPRESENTATIVES. ALL STATUTORY AND IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND OTHER THAN TITLE, ARE HEREBY EXPRESSLY NEGATED AND EXCLUDED. This warranty does not apply to goods which have been repaired or altered by other than authorized representatives of Seller, which have been subjected to misuse, negligence or accident or which have been operated or maintained or inspected other than in the strictest accordance with the applicable manuals or instructions furnished by Seller. Equipment and accessories not of Seller's manufacture, if any, are warranted only to the extent they are warranted by the manufacturers thereof, and Seller hereby assigns its interest under any such warranty to Buyer. ANY COMPLAINTS FOR BREACH OF WARRANTY MUST BE RECEIVED IN WRITING BY THE SELLER WITHIN 30 DAYS OF RECEIPT OF GOODS BY BUYER OR THE PERFORMANCE OF SERVICES HEREUNDER. The maximum liability for breach of warranty shall be the invoice price of the goods or services. Upon the Seller's request, Buyer shall return goods to Seller at Seller's expense.

8. LIMITATION OF LIABILITY AND INDEMNIFICATION

SELLER ASSUMES NO LIABILITY FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGE OF ANY KIND. Upon acceptance of the goods or services, Buyer assumes all liability for and shall hold Seller harmless against the consequences of use or misuse of the goods or services by Buyer, its employees and all others. Buyer agrees to defend and hold Seller harmless from any and all suits, claims or demands for injuries to or death of any person, or damage to or loss of property arising out of, in connection with, or incidental to the goods or services furnished by Seller, regardless of whether or not such Seller is liable for injuries, damage or loss under theories of joint or concurrent negligence. Buyer further agrees that it will pay, liquidate, discharge and satisfy any and all judgments, awards or expenses incurred by or rendered against Seller including all costs of suit, attorneys' fees and expenses arising out of any suit, claim or demand for injuries to or death of any person, or damage to or loss of property arising out of, in connection with or incidental to the goods or services furnished by Seller, regardless of whether or not the judgment, award, or expense was made in whole or in part, due to Seller's joint or concurrent negligence. As used in this paragraph, the term "Seller" shall include Seller, its officers, directors, employees and agents. Buyer's care, custody or control at any time of the goods contemplated herein shall give rise to a conclusive presumption between the parties that any negligence was joint or concurrent. This paragraph also applies in its entirety to suits, claims and demands brought under the theories of strict liability and product liability.

9. CHANGES AND GOODS MADE TO BUYER'S SPECIFICATIONS

Seller reserves the right to make any changes in material or design of its products, but bears no obligation to do so. Where goods are made to Buyer's specifications, it is on the express condition that Buyer shall bear all responsibility for and shall indemnify and hold Seller harmless from all suits or claims that the goods infringe on, contribute to the infringement of, or are alleged to infringe on or contribute to the infringement of any letters, patents, copyrights or trademarks, regardless of whether or not a portion of the specifications, drawings or designs were supplied by Seller.

10. SELLER INSPECTION AND TESTING

The goods are inspected and, where practicable, submitted to Seller's standard tests at Seller's plant before delivery. Buyer agrees to pay Seller reasonable additional charges for any additional tests which Buyer requires Seller to perform.

11. BUYER INSPECTION AND ACCEPTANCE

Within 30 days after tender of delivery to or receipt by Buyer of any shipment, Buyer shall inform Seller in writing if the goods are found defective or short in any respect. Failure to so inform Seller or any use by Buyer of the goods shall constitute conclusive evidence that Seller satisfactorily performed and Buyer waives any right to reject such goods thereafter.

12. COMPLIANCE WITH LAWS

Buyer agrees that in the performance hereof it will comply with all applicable laws, statutes, rules, regulations or orders of the national government or political subdivision thereof and same shall be deemed incorporated by reference herein. A. In the United States: Federal and State regulations require a copy of a Buyer's NRC license, Agreement State License, or Licensing State License together with all amendments, to be on file with Seller before any shipment of radioactive materials can be made. Buyer and Seller each warrant that it is an equal opportunity employer and that if this order is placed as a contract or sub-contract under United States overnment prime contract, those clauses required by federal law to be included are herein incorporated by reference. B. In Canada: A copy of the Buyer's AECB license, together with all amendments must be on file with Seller prior to any shipment of radioactive materials.

13. LIMITATION PERIOD

Causes of action for breach of contract relative to any order for goods or services shall not be asserted after one year from the date that said cause of action occurs, provided that this limitation shall not apply to actions by Seller to recover purchase price of the goods.

14. CANCELLATION

The contract arising out of Buyer's order cannot be changed after receipt by the Seller, nor can it be cancelled, transferred, or assigned to another, except by mutual agreement of the parties in a writing signed by both parties.

15. APPLICABLE LAW

Seller reserves any and all rights and remedies provided by law. The contract arising out of Buyer's order shall be interpreted and construed in accordance with the laws of the State of California. Jurisdiction for disputes arising out of this contract shall be in the Courts of the State of California.

16. WAIVERS

No waiver by Seller of any breach of any provision hereof shall constitute a waiver of a breach of any other provision or another breach of the same provision. Seller's failure to object to provisions contained in any communications from Buyer shall not be deemed an acceptance of such provisions, nor as a waiver of the provisions hereof.

17. NO OTHER REPRESENTATIONS

There are no understandings, agreements, representations or warranties, either written or oral, relative to the goods or services that are not fully expressed in this document. No statement, recommendation or assistance made or offered through Seller's representatives or contained in any sales literature is or constitutes a waiver by Seller of any of the provisions hereof. The provisions of this document supersede and cancel any previous understanding or agreement between the parties with respect to the subject matter hereof and this document expresses the final and complete understanding of the parties.

18. ARBITRATION

All disputes arising out of this contract, except actions by Seller to recover the purchase price of goods or services, shall be determined by binding arbitration in accordance with the rules of the American Arbitration Association. In such arbitration, the prevailing party shall be awarded attorneys' fees and costs (including costs of experts) and the provisions of California Code of Civil Procedure Section 1283.05 shall apply.



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