

*Quality
Control
Devices for
Molecular Imaging*

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RadQual, LLC was founded in 2000 by two experienced manufacturing and sales professionals who have committed their careers to nuclear medicine and diagnostic imaging. This affords us a unique perspective from which we are introducing the Bench/mark Product line, a new generation of current and innovative quality control products.

Keith Allberg, has over 41 years of experience with RadQual, DuPont Merck, Dupont and New England Nuclear (NEN) in radiopharmaceutical and source medical device engineering, manufacturing, regulatory, quality, marketing and sales.

Peter Ouimette, has worked in the diagnostic imaging sales and service fields for more than 36 years with Technicare—a Division of Johnson and Johnson, General Electric Medical Systems, Phillips Medical Systems, and ONES Medical Service.

RadQual, LLC is one of two source companies that is not owned and responsible to foreign entities and contracts manufacturing of the Bench/mark™ product line with International Isotopes Idaho, Inc. a US based and owned company whose employees have over 130 years of combined experience in manufacturing radionuclide and sealed sources for the industrial and medical communities.

Bench/mark products are available through select distributors Worldwide.

GENERAL INFORMATION

Distributors

RadQual is the only remaining American-owned provider of SPECT & PET imaging radioactive sealed sources for routine quality control. Our quality products are manufactured in Idaho Falls, Idaho, USA, and distributed worldwide through a select group of dealers and nuclear pharmacies.

For a list of Distributors, please go to our webpage at <http://www.radqual.com>. If you do not see a distributor listed for your area to place an order with, please contact us so that we can help you further.

Licensing Requirements

It is RadQual's policy to require written verification of the customer's Agreement State or NRC radioactive materials license for all items. No orders will be shipped or processed without a copy of the customer's license on file at International Isotopes Idaho Inc (INIS).

In the event that the customer's license has expired, a copy of the expired license and a timely renewal letter must be submitted. If the timely renewal letter is more than six months old we will contact the applicable regulatory authorities and confirm that the timely renewal is still valid. Compliance with applicable local, state and federal regulations concerning procurement and possession of radioactive materials is the responsibility of the customer.

Exempt Quantity Sources

Small amounts of some radioactive material typically may be purchased without a specific license per Nuclear Regulatory Commission (NRC) regulations 10CFR30.18 and 10CFR30.71 Schedule B or the equivalent Agreement State regulations. **However**, RadQual will not accept orders from customers nor will INIS ship orders to customers that are not licensed for radioactive material by the NRC or Agreement State Agency. Sources purchased as exempt quantities must be catalog items. NRC regulations prohibit the further incorporation or use of exempt sources in a manufactured device intended for further distribution if the manufacturer is not properly licensed. Contact the NRC or appropriate state agency for information on the use or possession of license exempt sources.

Quality Control and Quality Assurance

INIS has a well developed Quality Assurance program that has been verified to meet the standards of ANSI/AMSE NQA-1 as well as ISO 13485:2008. All of our products are manufactured in accordance with cGMP and customer specifications. The Company is a participating member of the National Institute of Standards and Technology/Nuclear Energy Institute's (NIST/NEI) Measurement Assurance Program for the radiopharmaceutical industry and is a registered manufacturer of class I medical devices with the U.S. Food and Drug Administration (FDA).

RadQual provides a wide range of nuclear medicine devices to which the CE Mark has been applied. This will indicate our conformity to the provisions of Council Directive 93/42/EEC (Annex II), which will enable our representative to, distributed freely within the European Community.

RadQual and INIS's continued compliance to these quality related regulations is assured through regular audits performed by independent audit teams as well as by trained personnel.

Product Changes

New product and manufacturing methods development is an ongoing process at RadQual and INIS. We reserve the right to change manufacturing methods, component materials and or fabrication techniques that will not affect the performance of the product, pending all necessary regulatory approvals.

Product Availability

Most items can be shipped from inventory, in the event that we need to manufacture the product for shipment please allow in five to seven working days after receipt of the order. Please contact the Sales and Marketing Department or your local RadQual distributor for more information regarding the availability of a certain product.

Return Policy

Due to the nature of our products, all sales are final and no items can be returned for credit without prior approval from RadQual or RadQual's distributor. At RadQual we understand that mistakes can be made and will do everything possible to assist you in rectifying the problem. If the product does not meet specifications, we will try to send a replacement product as soon as possible. Such a claim must be made, and the source returned to INIS, within 30 days after receipt of the shipment for full credit.

NOTE: Before any return is made, RadQual must be notified so that a return authorization can be obtained and necessary documents completed. Shipments returned without proper notification may be refused upon delivery and credit withheld.

Full credit will be given for sources that are found not to meet specifications as long as the source is returned to INIS within the 30 day. RadQual will be responsible for inbound freight of the suspect source, and the outbound freight for the replacement source.

Sources reported and returned after the 30 day period begins, will not be given credit and all freight expense belongs to the customer.

In the case that the customer ordered the incorrect source model the following will apply: The customer must notify RadQual or their distributor and return the source within 15 days of shipment to request a replacement source. There will be a restocking fee charged for the original source. If the customer notifies RadQual or their distributor after 15 days but before 30 days a 50% credit will be offered for the original source.

After a 30 day period no credit will be given without agreement from RadQual. In all instances the customer will be expected to pay all freight charges.

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

Source Disposal Policy

RadQual and their contract manufacturer will take back all nuclear medicine sources for disposal on a one-to-one basis. A source may be returned for disposal as long as the equivalent replacement source is purchased from RadQual's distributors.

The customer will be required to pay all shipping costs for the return of the sources unless prior

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

All necessary return documents are sent with new product shipments, it is the responsibility of the customer to ensure compliance with all guidelines and regulations relative to the shipment of radioactive materials. Shipments returned without a proper authorization may be refused upon delivery. Please note that customers **will** be charged for any unauthorized returns.

INIS has established a waste disposal program that may be used outside of the one for one basis. Please contact INIS directly (208-524-5300) for information on this program or visit their website at www.intisoid.com

Methods of Calibration

INIS participates in the Radioactivity Measurements Assurance Program (MAP) conducted by the National Institute of Standards and Technology (NIST) in cooperation with the Nuclear Energy Institute (NEI).

In this program NIST provides blind samples which are assayed by INIS, with the results sent to NIST. NIST then reports back to INIS the difference between the NIST calibrated value and INIS's calibrated value. In addition, INIS can send finished products to NIST for product verification and calibration. Over the years INIS has maintained a high degree of precision and accuracy with NIST. Traceability is established and maintained through this cross-calibration process.

A Certificate of Calibration is provided for each NIST traceable source purchased from RadQual, The Certificate provides a statement of traceability, a description of the physical and nuclear characteristics of the source, a description of the method of calibration, and quantitative identification of detected impurities. Activities are given in the Curie and SI systems.

All sources are manufactured to a precision of +20% / -10% with respect to the customer's requested activity, NIST traceable sources have an accuracy of $\pm 5\%$ or better with respect to the certified measured value. Non-traceable (nominal) sources have an accuracy of +20% / -10% with respect to the measured value and are supplied with a Nominal Data Sheet which characterizes the source.

The total uncertainty associated with a traceable source, is an estimate of the possible variance between the certified activity and the true activity, includes weighing uncertainty, random uncertainty, and systematic uncertainty. The quadratic combination of these uncertainties is generally less than $\pm 5\%$ at the 99% confidence level.

INIS maintains a variety of current nuclear detector/assay systems to calibrate sources and to check for impurities. The calibration equipment is checked daily using NIST traceable standards. Stability is further insured by maintaining the instrumentation in a carefully controlled environment. All assay equipment and techniques are verified through MAP on a regularly scheduled basis. Sources are either calibrated directly against NIST standards or by using NISI traceable assay equipment and techniques.

Flood Source Uniformity Verification

RadQual was the first in the industry to perform Quality Control of all flood sources using a gamma camera. It became apparent during our process validation that claiming an exact value for CV, INL and DNL would only lead to confusion as our protocols for testing and your procedures for daily performance might be different, which will result in different values. In addition as we use a unit cell (0.48 cm²) many times smaller than our competitors (6 cm²) comparing values between manufacturers would not be valid.

That being said RadQual stands 100% behind their products if you receive a source that does not meet specifications we will replace it immediately at no cost to the customer.

Coefficient of Variation (CV)

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

Integral Uniformity (INL) Measurement of the difference between the maximum count and the minimum count, expressed as a percentage. This value is a measurement of the difference between the coldest and hottest points.

Differential Uniformity (DNL) Measurement of the largest extremes between two neighboring points on the flood source; all of the neighboring points are compared, and the highest value is reported. This value describes how fluid the transition is from one unit cell to the next unit cell.

PRODUCT SHIPMENT

Packaging and shipment of radioactive materials of RadQual products by International Isotopes Idaho Inc. (INIS) adhere to the regulations of the US Department of Transportation regulations, 49CFR and the International Air Transportation Association (IATA).

INIS utilizes two types of packaging for shipment of radioactive source products: excepted packaging and type A packaging certificates of compliance can be found on the RadQual website.

Excepted Packaging “Limited Quantity” is used when the activity limits do not exceed those defined in 49 CFR 173.425 and IATA regulations table 10.5.A and the radiation level at any point on the package does not exceed 0.5 millirem per hour. All product shipments from INIS as “excepted packages” meet the requirements of 49 CFR 173.421 (1998) and IATA Dangerous Goods Regulation 10.5.9.4.

The quantity of radioactive material shipped in a Type A package is limited to the A1 and A2 values for special and normal form respectively. The A1 and A2 values are listed 49 CFR 173.435 and Table 10.4.A. of the IATA Dangerous Goods Regulations.

Labeling of Type A packages is based on the maximum external surface radiation level and the Transport Index (T.I.); a unit less number equivalent to the maximum radiation level in millirem/hour at a distance of one meter from the external surface of the package. Labeling criteria is prescribed in 49 CFR 172.403 and Paragraph 10.5.17.4 of the IATA Dangerous Goods Regulations. All radiation level measurements are made with a calibrated survey meter with appropriate detection capabilities.

HOW TO ORDER OR OBTAIN A QUOTE FOR RADQUAL'S BENCH/MARK PRODUCTS

RadQual only sells Bench/Mark products through its network of carefully selected distributors and Radiopharmacies. While this may lead to some lost sales, we at RadQual are committed to our distributors and feel that ethics outweigh the dollar. Our distributors share their customer lists with us and we believe that to use this information to compete directly with them is a violation of trust.

RadQual distributors can be found throughout the United States and the world, a list of our distributors is posted on our website. If you are having trouble finding a distributor or radiopharmacy that represents RadQual Products please contact:

Customer Service at 1-603-513-1221 or sales@radqual.com

We will direct you to one of our distributors or have them contact you immediately!

ANSI / ISO Classifications

(determination of product integrity)

These standards were written so that manufacturers, appropriate regulatory agencies, and the end users would have specifications that would characterize radioactive sources and establish defined performance standards.

Current copies of these standards are available from:

American National Standards Institute 1430 Broadway New York, NY 10018 (212) 642-4900

International Organization for Standardization
1, Rue De Varembel
Case Postale 56
CH-1211 Geneva 20 Switzerland 41-22-734-0150

The concept of both ANSI N54.2 and ISO 2919 is that design standards are suggested not required for source design. However to be classified as a sealed source for routine distribution, design standards must be met and approval or acceptance by the appropriate regulatory authorities must be obtained, and the product listed on the Sealed Source and Device Registry (SS&D).

RadQual's Bench /Mark Products

<u>Product</u>	<u>ANSI Classification</u>	<u>SS&D Number</u>
Dose Calibrator	97C22312	NR-1235-S-102-S
Flood Sources	97C22312	NR-1235-S-104-S
GE-68 Line Sources	97C32312	NR-1235-S-105-S
Spot Markers	97C22212	NR-1235-S-106-S
Co-57 Line Sources	97C22212	NR-1235-S-107-S
GE-68 Cylinder	97C22312	NR-1235-S-108-S
Fen Point Marker	97C22212	NR-1235-S-109-S

SOURCE SAFETY

Table 2 Sealed source classification (performance) requirements for typical usage

		Sealed source class, depending on test				
		Temperature	Pressure	Impact	Vibration	Puncture
Radiography- Industrial	Sealed source	4	3	5	1	1
	Source to be used in device	4	3	5	1	1
Medical	Radiography	3	2	3	1	2
	Gamma teletherapy	5	3	5	2	4
	Brachytherapy ^{note 1}	5	3	2	1	1
	Surface applicators ^{note 2}	4	3	3	1	2
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 fluorescence analysis		3	3	2	2	2
Oil-well logging		5	6	5	2	2
Portable moisture and density gauge (including hand-held or dolly-transported)		4	3	3	3	3
General neutron source application (excluding reactor start		4	3	3	2	3
Calibration source activity >1 MBq		2	2	2	1	2
Gamma irradiation sources	Category 1 ^{note 2}	4	3	3	2	3
	Categories II, III and IV ^{note 3}	5	3	4	2	4
Ion generators ³⁾	Chromatography	3	2	2	1	1
	Static eliminators	2	2	2	2	2
	Smoke detector ^{note 2}	3	2	2	2	2

1) Sources of this nature may be subject to severe deformation in use. Manufactures and users may wish to formulate additional or special test procedures.

2) Excluding gas-filled sources.

3) "Source in device" or a "source assembly" may be tested.

The requirements take into account normal usage but do not include exposure to fire, explosion or corrosion. The tests specified do not cover all usage situations and where conditions do not match those specified in Table 2 appropriate tests on an individual basis may be required.

SOURCE SAFETY

Table 1. Classification of sealed source performance

Test	Class						
	1	2	3	4	5	6	X
Temperature	No test	-40°C (20min) +80°C (1 h)	-40°C (20min) +180°C (1h)	-40°C (20min) +400°C (1 h) and thermal shock to 20°C	-40°C (20min) +600°C (1h) and thermal shock to 20°C	-40°C (20min) +800°C (1 h) and thermal shock to 20°C	Special test
External pressure	No test	25kPa absolute to atmospheric	25kPa absolute to 2MPa absolute	25kPa absolute to 7MPa absolute	25kPa absolute to 70MPa absolute	25kPa absolute to 170MPa absolute	Special test
Impact	No test	50g from 1 m or equivalent imparted energy	200g from 1 m or equivalent imparted energy	2kg from 1 m or equivalent imparted energy	5 kg from 1 m or equivalent imparted energy	20kg from 1 m or equivalent imparted energy	Special test
Vibration	No test	3 times 10min 25 to 500Hz at 49m/s ² (5g _n)	3 times 10min 25 to 50Hz at 49m/s ² (5g _n) and 50 to 90Hz at 0.635mm amplitude peak to peak and 90 to 500Hz at 96m/s ² (5g _n)	3 times 30min 25 to 80Hz at 1.5mm amplitude peak to peak and 80 to 2000Hz at 196m/s ² (20g _n)	Not used	Not used	Special test
Puncture	No test	1g from 1 m or equivalent imparted energy	10g from 1m or equivalent imparted energy	50g from 1 m or equivalent imparted energy	300g from 1 m or equivalent imparted energy	1 kg from 1 m or equivalent imparted energy	Special test

Notes to table 1.

1. Details of the testing procedures are given in 150.2919 and ANSI N43.6-1997. A further class X can be used where a special test procedure has been adopted.

2. External pressure

100kPa=1 atmosphere (approximate)

3. Impact test

The source, positioned on a steel anvil, is struck by a steel hammer of the required weight; the hammer has a flat striking surface, 25mm diameter, with the edges rounded.

4. Puncture test



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Flood Sources

Rectangular Series

BM01, BM04, BM55 & BM07



- **Guaranteed** source performance.
- **Guaranteed** 100% of labeled activity at time of receipt, you get what you pay for.
- **Guaranteed** < 0.08% combined Co-56/Co-58 at reference date allowing for immediate use. The days of storing sources for 2 to 3 months are over, resulting in a 15% to 20% savings.
- **Guaranteed** dual head quality control acquisition. RadQual's source is tested for uniformity on both sides. Coefficient of variation less than $\pm 1.0\%$ (typical is less than $\pm 0.8\%$) and integral uniformity less than $\pm 2.5\%$ (typical is less than $\pm 1.7\%$).

			LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)
R24	BM01L SERIES : WT. 7 lbs.				
	ENCAPSULATION		25.4" (64.5)	17.9" (45.5)	0.35" (0.89)
	CO-57 MATRIX		23.9" (60.7)	16.5" (41.8)	
R18	BM04 SERIES : WT. 5 lbs.				
	ENCAPSULATION		19.6" (49.8)	15.6" (39.6)	0.7" (1.8)
	CO-57 MATRIX		18.0" (45.7)	14.0" (35.6)	
R16	BM07 SERIES : WT. 3 lbs.				
	ENCAPSULATION		17.1" (43.4)	10.9" (27.7)	0.3" (0.76)
	CO-57 MATRIX		15.5" (39.4)	9.25" (23.5)	
R11	BM55 SERIES : WT. 3 lbs.				
	ENCAPSULATION		11.5" (29.2)	10.3" (26.1)	0.7" (1.8)
	CO-57 MATRIX		10.0" (25.4)	10.0 (25.4)	

Sold by select dealers worldwide.

Email: Sales@radqual.com



Flood Sources

Round Series

BM02



- **Guaranteed** source performance.
- **Guaranteed** 100% of labeled activity at time of receipt, you get what you pay for.
- **Guaranteed** < 0.08% combined Co-56/Co-58 at reference date allowing for immediate use. The days of storing sources for 2 to 3 months are over, resulting in a 15% to 20% savings.
- **Guaranteed** dual head quality control acquisition. RadQual's source is tested for uniformity on both sides. Coefficient of variation less than $\pm 1.0\%$ (typical is less than $\pm 0.8\%$) and integral uniformity less than $\pm 2.5\%$ (typical is less than $\pm 1.7\%$).
- **All sources** are shipped with a custom decay calendar eliminating the need to calculate or guess your source's strength.
- **RadQual performs** quality control on every flood source using a gamma camera, thereby ensuring that we see what you see, 100% of the UFOV, and the first to offer a money back guarantee.
- **Sealed Source** and Device Registration Number is NR-1253-S-104-S

BENCH/MARK CIRCULAR FLOOD SOURCE DIMENSIONS

		DIAMETER (CM)	WIDTH (CM)	THICKNESS (CM)
C18	BM02 SERIES : WT. 5 lbs.			
	ENCAPSULATION	20.3" (51.6)	NA	0.7" (1.8)
	CO-57 MATRIX	18.5" (46.9)	NA	

Sold by select dealers worldwide.

Email: Sales@radqual.com



Flood Sources

Square Series

BM05



- **Preferred supplier by camera manufacturer**
- **Guaranteed** source performance.
- **Guaranteed** 100% of labeled activity at time of receipt, you get what you pay for.
- **Guaranteed** < 0.08% combined Co-56/Co-58 at reference date allowing for immediate use. The days of storing sources for 2 to 3 months are over, resulting in a 15% to 20% savings.
- **RadQual's** source is tested for uniformity on both sides. Coefficient of variation less than $\pm 1.0\%$ and integral uniformity less than $\pm 2.5\%$.
- **All sources** are shipped with a custom decay calendar eliminating the need to calculate or guess your source's strength.
- **RadQual performs** quality control on every flood source using a gamma camera, thereby ensuring that we see what you see, 100% of the UFOV, and the first to offer a money back guarantee.
- **Sealed Source** and Device Registration Number is NR-1235-S-104-S

BENCH/MARK SQUARE FLOOD SOURCE DIMENSIONS

		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)
S10	BM05 SERIES : WT. 2 lbs			
	ENCAPSULATION	11.5" (29.2)	11.5" (29.2)	0.7" (1.8)
	CO-57 MATRIX	10.0" (25.4)	10.0" (25.4)	

Square Series

BM05-99

EXCLUSIVE FOR USE ON A
DILON 6800

0.5 mCi to 3.0 mCi activity



- **Preferred supplier by camera manufacturer**
- **Guaranteed** source performance .(1)
- **Guaranteed** 100% of labeled activity at time of receipt, you get what you pay for.
- **Guaranteed** < 0.08% combined Co-56/Co-58 at reference date allowing for immediate use. The days of storing sources for 2 to 3 months are over, resulting in a 15% to 20% savings.
- **RadQual's** source is tested for uniformity on both sides. Coefficient of variation less than $\pm 1.0\%$ and integral uniformity less than $\pm 2.5\%$.
- **All sources** are shipped with a custom decay calendar eliminating the need to calculate or guess your sources strength.
- **RadQual** performs quality control on every flood source using a gamma camera, thereby ensuring that we see what you see, 100% of the UFOV
- **Sealed Source** and Device Registration Number is NR-1235-S-104-S

BENCH/MARK SQUARE FLOOD SOURCE DIMENSIONS

		LENGTH (CM)	WIDTH (CM)	THICKNESS (CM)
S10	BM05 SERIES : WT. 2 lbs			
	ENCAPSULATION	11.5" (29.2)	11.5" (29.2)	0.7" (1.8)
	CO-57 MATRIX	10.0" (25.4)	10.0" (25.4)	

Bench/Mark Product Line

May 2017

Co-57 Flood Source Cross Reference Chart

CAMERA MFG.	CAMERA MODEL NO. / NUMBER OF HEADS	SOURCE TYPE	HEAD SIZE	RECOMMENDED NOMINAL ACTIVITY	RADQUAL SOURCE MODEL	
Philips (ADAC)	ARGUS/1 HEAD	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	BRIGHTVIEW	RECTANGULAR	16" X 20.25"	10 mCi	BM01L-10	
	CARDIAL	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	CARDIO 60	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	CARDIO MD 90	RECTANGULAR	9.2" X 15.4"	10 mCi	BM07-10	
	CIRRUS/1 HEAD	CIRCULAR	15"	10 mCi	BM02-10	
	FORTE	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	GENESYS/1or2 HEADS	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	SKYLIGHT	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	SOLUS	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
	VERTEX	RECTANGULAR	15" X 20"	10 mCi	BM01L-10	
MARCONI (PICKER)	AXIS (2HD)/IRIX (3HD)	RECTANGULAR	21" x 15.5"	10 mCi	BM01L-10	
	MERIDA	RECTANGULAR	20.47" X 14.57"	10 mCi	BM01L-10	
	PRISM 1000/1 HEAD	RECTANGULAR	20" x 15"	10 mCi	BM01L-10	
	PRISM 2000/2 HEAD	RECTANGULAR	20" x 15"	10 mCi	BM01L-10	
G.E. MED. SYS.	Brivo NM615	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	DISCOVERY 530c	RECTANGULAR		20 mCi	BM55-20	
	DISCOVERY 630	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	Discovery 640 Optima	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	DISCOVERY NM/CT 670	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	DISCOVERY 750B	SQUARE		20 mCi	BM05-20	
	DISCOVERY VH	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	HAWKEYE	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	INFINIA	RECTANGULAR	21.25" x 15.74"	10 mCi	BM01L-10	
	MAXXUS/2 HEAD	RECTANGULAR	21" x 16"	10 mCi	BM01L-10	
	MILLENNIUM MG	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	MILLENNIUM MPR/VG	RECTANGULAR	15.75" x 21.75"	10 mCi	BM01L-10	
	MILLENNIUM MPS	SQUARE	14" x 14"	10 mCi	BM01L-10	
	MYOSIGHT	RECTANGULAR	14" x 20"	10 mCi	BM01L-10	
	OPTIMA	RECTANGULAR	9" X 14"	7.5 mCi	BM07-10OPT	
	STARCAM XRT/1 HEAD	RECTANGULAR	21" x 16"	10 mCi	BM01L-10	
VENTRI	RECTANGULAR	15.5" X 9.25"	10 mCi	BM07-10		
ELSCINT	CARDIAL/2 HEADS	RECTANGULAR	15.75" x 10"	10 mCi	BM04-10	
	HELIX/2 HEADS	RECTANGULAR	21.25" x 15.75"	10 mCi	BM01L-10	
	SP4/1 HEAD	CIRCULAR	15.75"	10 mCi	BM02-10	
	SP6/1 HEAD	RECTANGULAR	21.25" x 15.75"	10 mCi	BM01L-10	
	VARICAM/2 HEADS	RECTANGULAR	21.25" x 15.75"	10 mCi	BM01L-10	
	SMV (SOPHA)	BODYTRAC	RECTANGULAR	21.3" x 15.75"	10 mCi	BM01L-10
		DST/2 HEAD	RECTANGULAR	12.99" x 16.92"	10 mCi	BM04-10
DSTI/DSI		RECTANGULAR	12.99" x 16.92"	10 mCi	BM04-10	
DSTXL/2 HEAD		RECTANGULAR	21.3" x 15.75"	10 mCi	BM01L-10	
DSTXLI/2 HEAD		RECTANGULAR	21.3" x 15.75"	10 mCi	BM01L-10	
DSX/1 HEAD		CIRCULAR	15.75"	10 mCi	BM02-10	
DSX/1 HEAD		RECTANGULAR	21.3" x 15.75"	10 mCi	BM01L-10	
VISION FX SERIES		RECTANGULAR	20" x 15"	10 mCi	BM01L-10	
SIEMENS		BODY SCAN	RECTANGULAR	23.5" x 13.5"	10 mCi	BM01L-10
		3700,7500 ORBITER SERIES	CIRCULAR	15.25"	10 mCi	BM02-10
	C CAM	RECTANGULAR	15.8" x 9.7"	10 mCi	BM07-10	
	DIACAM	RECTANGULAR	21.25" x 15"	10 mCi	BM01L-10	
	ECAM/2 HEADS	RECTANGULAR	21.25" x 15"	10 mCi	BM01L-10	
	MULTISPECT 2/2 HEADS	RECTANGULAR	21.25" x 15"	10 mCi	BM01L-10	
	MULTISPECT 3/3 HEADS	RECTANGULAR	16" x 12"	10 mCi	BM04-10	
	SYMBIA FAMILY	RECTANGULAR	21.25" X 15"	10 mCi	BM01L-10	
	Digirad	Ergo	RECTANGULAR	15.6" x 12.2"	10 mCi	BM04-10
2020tc IMAGER		SQUARE	11" X 11"	10 mCi	BM05-10	
CARDIUS		SQUARE	11" x 11"	10 mCi	BM05-10	
CARDIUS 3		SQUARE	11" x 11"	10 mCi	BM05-10	
MEDISO (NC SYSTEMS)	CARDIOSPECT D90	RECTANGULAR	16.9" x 9.6"	10 mCi	BM04-10	
	ANYSCAN	RECTANGULAR	23" x 18.5"	10 mCi	BM01L-10	
GVI MD	mSPECT	RECTANGULAR	14.8" x 9.6"	10 mCi	BM07-10	
	Clearvision	SQUARE	11" X 11"	10 mCi	BM05-10	
Dilon	6800 Acella	RECTANGULAR	14.8" x 9.6"	15 mCi	BM07-15	
	6800 BSG	SQUARE	NA	0.5 mCi	BM05-99D	
	6800 BSG with Attenuation plates	SQUARE	NA	3.0 mCi max	BM05-99D3	
Gamma Medica	LumaGEM	Square	8.0" x 6.0"	10 mCi	BM05-10	
Mid Atlantic Imaging	miaCAM	RECTANGULAR	15.2" x 10.2"	10 mCi	BM04-10	
Universal Medical Resources	CorCam	RECTANGULAR	14.6" x 8.5"	10 mCi	BM07-10	



Shielding & Cases

Radshield™ Flood Source Sheilding



Radshield™ was designed to provide an easier alternative for transferring your source to the camera with minimal exposure without moving a 60 plus pound case around your Nuclear Medicine Department. As a result of customer feedback, Radshield is in its' third generation, and we believe is now optimized. While weighing only 30 pounds it provides similar radiation dose reduction as the typical hard case, by shielding the surface of the source not an oversize case.

	ONLY RADSHIELD™	COMPETITOR'S HARD CASE
	(millirem/hour/millcurie)	
@ contact	0.1	0.07
@ 30 cm	0.04	0.03
@ 1 m	0.01	0.01

Based on a 15 mCi Co-57 source using a Bicron MicroRem meter with Co-56/Co-58 levels below 0.08% combined.

Sold by select dealers worldwide.

Email: Sales@radqual.com



Shielding & Cases

Radscooter™ Flood Source Transport



Radscooter™ was designed to provide an alternative for transferring your source to the camera with minimal exposure without moving a 60 plus pound case or carrying a 30 pound Radshield™ around your Nuclear Medicine Department or Hospital. For storage purposes it requires no more area than a typical hard case and is available for BM01, BM02, and BM04 model sources only..

Physical Dimensions (Maximum):

7 inches wide (18 cm) x 30.2 inches long (77cm) x 32.5 inches high ((83cm)

	Only Radshield™	Competitor's Hard Case
(millirem/hour/millcurie)		
@ contact	0.1	0.07
@ 30 cm	0.04	0.03
@ 1 m	0.01	0.01
Based on a 15 mCi Co-57 source using a Bicron MicroRem meter with Co-56/Co-58 levels below 0.08% combined.		

“E” Vial Sources For SPECT Imaging



- Dose calibrator sources are generally available for immediate shipment upon receipt of confirmed order.
- BM06S-157 are available for shipment within 7 working days of confirmed order receipt.
- All Dose calibrator sources are calibrated against a traceable National Institute of Standards (NIST) solution. In an similar geometry, using a pressurized ion chamber. They contain approximately 23 cc's of total volume with 20cc's of active epoxy.
- Each source is packaged in an individual lead shield that is color coded to the source
- All sources are shipped with a Certificate of Calibration, Leak Test Certification, radiation safety and handling instructions and a custom decay calendar.

BM06E-57 Cobalt -57	5.0 mCi
BM06E-60 Cobalt-60	0.05 mCi
BM06E-33 Barium -133	0.25 mCi
BM06E-37 Cesium -137	0.2 mCi
BM06E-157 Cobalt -57	10.0 mCi
BM06E-90 Set of 3 sources BM06E-33, BM06E-37, and BM06S-57	

SS&D NR-1235-S-102-S

(activity levels above are nominal values)



Dose Calibrator Sources

Dual Geometry (Vial and/or Syringe) Sources For SPECT Imaging



- Dose calibrator sources are generally available for immediate shipment upon receipt of confirmed order.
- BM06S-157 are available for shipment within 7 working days of confirmed order receipt.
- All Dose calibrator sources are calibrated against a traceable National Institute of Standards (NIST) solution. In an similar geometry, using a pressurized ion chamber. They contain approximately 5cc's of total volume with 3cc's of active epoxy.
- Each source is packaged in an individual lead shield that is color coded to the source
- All sources are shipped with a Certificate of Calibration, Leak Test Certification, radiation safety and handling instructions and a custom decay calendar.
- Dimensions: total source Height 3.0", Major Diameter 1.125", Minor Diameter 0.625", Activity Height 1.5" and Activity Diameter 0.445"

BM06S-57 Cobalt -57	5.0 mCi
BM06S-60 Cobalt-60	0.05 mCi
BM06S-33 Barium -133	0.25 mCi
BM06S-37 Cesium -137	0.2 mCi
BM06S-157 Cobalt -57	10.0 mCi
BM06S-90 Set of 3 sources BM06S-33, BM06S-37, and BM06S-57	

SS&D NR-1235-S-102-S

(activity levels above are nominal values)



Dose Calibrator Sources

“V” Vial Sources (Multidose Vial)



- Dose calibrator sources are made to order upon receipt of confirmed order.
- Dose calibrator sources are available in 3 sizes 5cc, 10cc, or 20cc.
- All Dose calibrator sources are calibrated against a traceable National Institute of Standards (NIST) solution. In an similar geometry, using a pressurized ion chamber.
- Each source is packaged in an individual lead shield that is color coded to the source
- All sources are shipped with a Certificate of Calibration, Leak Test Certification, radiation safety and handling instructions and a custom decay calendar.

BM06V-xx-57 Cobalt -57	5.0 mCi
BM06V-xx-60 Cobalt-60	0.05 mCi
BM06V-xx-33 Barium -133	0.25 mCi
BM06V-xx-37 Cesium -137	0.20 mCi
BM06V-xx-157 Cobalt -57	10.0 mCi
XX denote the vial size needed.05 for 5cc, 10 for 10cc, 20 for 20cc	

SS&D NR-1235-S-102-S
(activity levels above are nominal values)

Sold by select dealers worldwide.

Email: Sales@radqual.com



Spot Markers

Spot Markers Co-57, Na-22 & Ge-68 Nominal and High Activity Values



RadQual's Spot Markers are reference sources manufactured by gravimetric transfer of a Co-57/epoxy mixture and checked by ion chamber for content. There are two designs available. The traditional Lucite marker with a total diameter of 1.0 inches (2.54 cm), an active area of 0.125 inches (3 mm) and a total thickness of 0.25 inches (6.4 mm). The Aluminum marker has the same physical characteristics but is designed and approved by regulatory authorities for activity content up to 12.0 mCi (444 MBq) of Co-57.

All sources are shipped in appropriate shielding for storage and transport and should be used only as directed by your organization.

- BM03-57L-50 Cobalt-57 50 uCi
- BM03-57L-100 Cobalt-57 100 uCi
- BM03-22L-100 Sodium-22 100 uCi (lower activity levels available)
- BM03-68L -100 Germanium-68 max 100 uCi (lower activity levels available)

SS&D NR-1235-S-106-S

- BM03-57L-XXX Cobalt-57 Maximum 1.0 millicuries
- BM03-57A-XXX Cobalt-57 Maximum 5.0 millicuries
- BM03-22A-XXX Sodium-22 Maximum 0.5 millicuries
- BM03-68A-XXX Germanium-68 Maximum 0.5 millicuries

SS&D NR-1235-S-106-S

Sold by select dealers worldwide.

Email: Sales@radqual.com



Spot Markers

Left and Right Markers

BM03-57-LR
Co-57, 100 uCi



RadQual's Spot Markers are reference sources manufactured by gravimetric transfer of a Co-57/epoxy mixture and checked by ion chamber for content.

Right and Left Markers aid in patient orientation for both SPECT/ and Planar Imaging and denotes Left and Right side of image.

- Nominal activity is 33 uCi left marker and 66 uCi Right marker.
- Activity concentration in uCi per mm is equivalent in both markers
- Disc dimensions are 2 inch diameter (2.54 cm) and 0.25 inches thick (0.63 cm).
- Disc is backfilled with epoxy to seal in activity
- Sources shipped with Technical Data sheet that includes Radiation Safety Recommendations and LeakTest Results.

All sources are shipped in appropriate shielding for storage and transport and should be used only as directed by your organization.



Pen Point Markers

Pen Point Markers BM10 Series



RadQual's Penpoint Marker is designed for highlighting or tracing the outlines of a particular anatomical region or feature on a patient during imaging. It is constructed using 300 series stainless steel. Each source is supplied with a threaded cap to shield the active point when the source is not being used with 0.5 inch wall thickness. The overall length of the source with shield in place is 10.1" (25.6 cm), with the shield removed the length decreases to 9.26" (23.5 cm). The penpoint marker has a diameter of 0.25" (6.3 mm).

Specifications:

BM10-057-100	Penpoint Marker contain 100 uCi (3.7 MBq)
BM10-057-200	Penpoint Marker contain 200 uCi (7.4 MBq)
BM10-057-250	Penpoint Marker contain 250 uCi (9.25 MBq)

Penpoint markers containing Co-57 are available up to 1.0 mCi (37 MBq). Additional models are available manufactured using Cs-137 or Ba-133 with maximum activities of 0.2 mCi (7.4 MBq) or Ge-68/Ga-68 with a maximum activity of 0.5 mCi (18.5 MBq).



Line Sources

Flexible Line Source BM83-10



Extremely flexible and easily shaped into configurations necessary for outlining areas of interest. Sources contain 150 uCi of Co-57 evenly distributed throughout the epoxy over the 19.7" (50 cm) active length. (<5 uCi/in). The activity is uniformly dispersed in the epoxy matrix and encapsulated in a thin "poly" tube with an 0.032" (0.8mm) inside diameter and a 0.094" (2.4mm) outside diameter. Custom sources can be made containing a maximum activity 1.2 millicuries (44.4 MBq)

SS&D NR-1235-S-107-S



Line Sources

Rigid Line Source BM83-40



Rigid Line Sources are used to test SPECT camera head rotation alignment. RadQual offers Co-57 line sources in range of activities and dimensions to meet the different requirements of various camera manufacturers. Standard activity is 1.5 mCi; maximum source activity is 25 mCi, overall length 12.5 inches, active length 12.0 inches, overall diameter 0.25 inches and active diameter is 0.04 inches. All sources are double encapsulated stainless steel. Sources shipped with Technical Data sheet that includes Radiation Safety Recommendations and Leak Test Results.

The output linearity meets a specification of $\pm 5\%$ coefficient of variation as measured for 5 mm segments versus the mean value for all segments.

SS&D NR-1235-S-107-S



Co-57 Rulers

Co-57 Flexible Ruler

BM83-20



Aids in indicating anatomical location for SPECT Imaging. Aids in indicating organ size or region of interest by counting the number of visible "hot and cold" segments for SPECT Imaging. Sources contain 460 microcuries of Co-57 (20 microcuries per segment). Each source contains 23 "hot" 1 cm segments and 24 "cold" 1 cm stainless steel segments, total length is 18.9 inches (48 cm). Custom sources can be made containing a maximum activity 1.2 millicuries (44.4 MBq).

SS&D NR-1235-S-107-S



Co-57 Rulers

Co-57 Rigid Ruler BM83-30



Aids in indicating anatomical location for SPECT Imaging. Helps in indicating organ size or region of interest by counting the number of visible “hot and cold” segments for SPECT Imaging. Sources contain 160 microcuries of Co-57 (20 microcuries per segment). Each source contains 8 “hot” 1 cm segments and 9 “cold” 1 cm segments, total length is 6.7 inches (17 cm). Custom sources can be made containing a maximum activity 1.2 millicuries (44.4 MBq).

SS&D NR-1235-S-107-S



Rod Sources

Rod Sources

BM08 Series



RadQual's calibrated rod sources typically have a calibration accuracy of $\pm 3\% - 5\%$ at a 95% confidence level. Physical dimensions are 2.96 inches (75 mm) total length by 0.47 inches (11.9 mm) diameter. The calibrated rod sources are manufactured by gravimetric transference of NIST traceable solutions. Calibration is confirmed using a Sodium Iodide detector.

All rod sources are shipped with a custom decay calendar.

RadQual's rod sources are designed to mimic a tube source so there is no need to buy duplicate products.

Activity end is color coded to provide easier identification, Red/Co-57, Green/Cs-137 and Black/Ba-133.

BM08-57	Cobalt-57 0.1 uCi
BM08-571	Cobalt-57 1.0 uCi
BM08-37	Cesium-137 0.1 uCi
BM08-3705	Cesium-137 0.5 uCi
BM08-371	Cesium-137 1.0 uCi
BM08-33	Barium-133 0.1 uCi
BM08-331	Barium-133 1.0 uCi

PET Imaging Simulated F-18 Source (Ge-68/Ga-68)

- Directly Traceable to NIST and cross calibrated for Ge68/Ga68 calibration.
- Dose calibrator sources are generally available for immediate shipment upon receipt of confirmed order.
- Dose calibrator standards are calibrated against a traceable National Institute of Standards (NIST) source, in an identical geometry and configuration, using a pressurized ion chamber.
- Each source is packaged in an individual lead shield.
- All sources are shipped with a Certificate of Calibration, Leak Test Certification, radiation safety and handling instructions and a custom decay calendar.



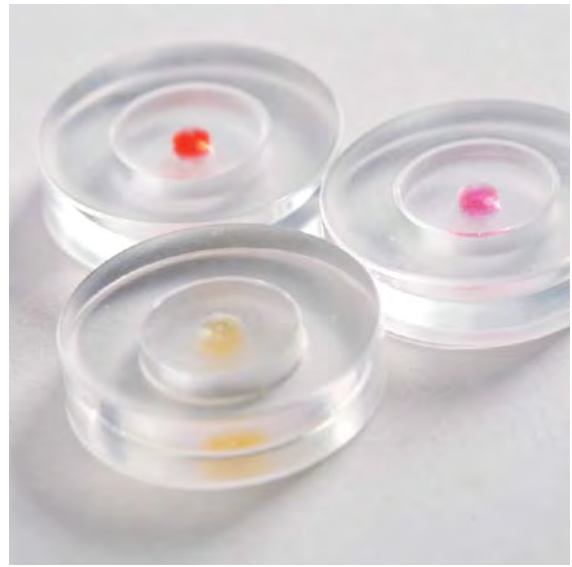
BM06S-6805	<i>0.5 mCi (18.5 MBq)</i>
BM06S-681	<i>1.0 mCi (37 MBq)</i>
BM06S-681XS	<i>1.0 mCi (37 MBq) with extra shielding</i>

*SS&D NR-1235-S-102-S
(activity levels above are nominal values)*

PET Imaging Spot Markers

RadQual's Spot Markers are reference sources manufactured by gravimetric transfer of Na-22 or Ge-68 sealed with an epoxy mixture and checked by ion chamber for content. There are two designs available.

The traditional Lucite marker with a total diameter of 1.0 inches (2.54 cm), an active area of 0.125 inches (3 mm) and a total thickness of 0.25 inches (6.4 mm) and contains a teflon CT marker incorporated into the active matrix. The Aluminum marker has the same physical characteristics but is designed and approved by regulatory authorities for activity content up to 0.6 mCi (22.2 MBq) of Na-22 or Ge-68.



All sources are shipped in appropriate shielding for storage and transport and should be used only as directed by your organization.

BM03-22L	Lucite marker containing a maximum of 0.12 mCi (4.44 MBq) of Na-22
BM03-22A	Aluminum marker containing a maximum of 0.6 mCi (22.2 MBq) of Na-22
BM03-68L	Lucite marker containing a maximum of 0.12 mCi (4.44 MBq) of Ge-68
BM03-68A	Aluminum marker containing a maximum of 0.6 mCi (22.2 MBq) of Ge-68



PET Imaging Rod Source

PET Imaging Simulated F-18 Rod Source (Ge-68/Ga-68)

RadQual's calibrated rod sources typically have a calibration accuracy of $\pm 3\% - 5\%$ at a 99% confidence level. Physical dimensions are 2.96 inches (75 mm) total length by 0.47 inches (11.9 mm) diameter.



RadQual's calibrated rod sources are manufactured by gravimetric transference of NIST traceable solutions.

Calibration is confirmed using a sodium Iodide detector.

All rod sources are shipped with a custom decay calendar.

RadQual's rod sources are designed to mimic a tube source so there is no need to buy duplicate products.

BM08-68	0.1 uCi to 0.3 uCi Ge-68/Ga-68 other sizes available upon request to a maximum of 1.5 uCi
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PET Imaging F-18 X-Cal System

X-CAL F-18 System (Ge-68/Ga-68) BMCY68-0404 Series

This patented product and application allows for cross calibration of your PET scanner, dose calibrator, and well detector for Ga-68 and F-18, and is useful in multi-center imaging trials to both assess bias and enable correction of biases due to instrumentation factors for serial PET studies.



BMCY68-0404 series contains a 0.5 mCi (18.5 MBq) of Ge-68/Ga-68 (in secular equilibrium) cylinder which is implicitly traceable to NIST this is supplied with a base mount for the Data Spectrum ECT Phantom. The dose calibrator for this series contains approximately 25 uCi (0.90 MBq) of F-18 equivalent activity and is directly traceable to NIST. The rod source contains approximately 0.14 uCi (3.85 kBq) and is implicitly traceable to NIST. A custom decay chart for Ge-68/Ga-68 and F-18 are provided with this source series.

Why Radqual Pet F-18 X-Cal System?

All of the sources in this set are manufactured from the same Ge68/Ga-68 epoxy process using NIST traceable balances to ensure accurate measurement of weight. Our proprietary process allows for extremely uniform activity distribution within the cylinder. The content of the cylinder and rod source are determined by the concentration of the directly traceable dose calibrator standard. So the activity contents of all of the sources are known at the 95% confidence level with +/- 2.5%.

Physical Dimensions:

Cylinder	overall dimensions	9.37 cm (3.68 inches) height
		7.04 cm (2.77 inches) diameter
	active matrix	4.50 cm (1.77 inches) height
Base Mount		4.50 cm (1.77 inches) diameter
		18.0 cm (7.08 inches) diameter