

Brachytherapy Source Calibration

HDR and LDR Iridium, Iodine, Palladium, Cesium, and Strontium



MAX 4000 Electrometer and HDR 1000 Plus Well Chamber.

Calibration of individual and multiple isotopes



Outstanding versatility and reliability



Performance validated in over 30 scientific presentations

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HDR 1000 Plus Well Chamber

The **HDR 1000 Plus Well Chamber***, REF 90008, precisely calibrates radioactive sources used for cancer treatment. The HDR 1000 Plus is the standard instrument for independently verifying prescribed patient dose. This verification helps protect the hospital from misadministration and liability. The HDR 1000 Plus is an air communicating chamber so there is no inaccuracy due to an undetected gas leak as in a pressurized chamber. Performance of the HDR 1000 Plus has been **validated in over 30 publications**.

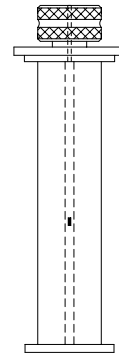
The HDR 1000 Plus is ideal for low dose rate and high dose rate brachytherapy. Source holders are available for most existing isotopes available on the market today. If we do not list a source holder for the isotope you wish to measure, contact us and we will develop one for you.

* Licensed from WARF, University of Wisconsin, Madison, WI.

High Dose Rate ¹⁹²Ir Calibrations

Source Holder for High Dose Rate Iridium, REF 70010, has a 2.2mm opening for the catheter. A rubber O-ring secures the catheter with a uniform constricting pressure to prevent any movement of the catheter.

The calibration procedure is easy and uncomplicated. The time required for calibration is only a fraction of that required for thimble ion chamber techniques.



High Dose Rate ¹⁹²Ir Quality Assurance Tests

Perform the following crucial tests:

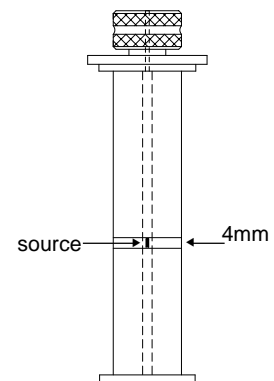
- Source positioning verification to 0.3mm
- Timer accuracy
- Consistency of source activity

The benefits are:

- Fast, 10-15 minute procedure†
- No films and development procedures
- No multiple distance estimates

Quality Assurance Tool, REF 70008, tightly collimates the radiation received by the HDR 1000 Plus to a narrow plane. Three short measurements are taken as the ¹⁹²Ir source is advanced to the 4mm opening.

Wall Mounted Bracket, REF 70007, secures the HDR 1000 Plus next to your afterloader for periodic quality assurance checks for verification of source presence, source strength, calibration accuracy, and timer consistency.



†DeWerd, Jursinic, Kitchen, Thomadsen: "A new daily quality assurance tool for HDR systems." *Med. Phys.* April 1995.

†Thomadsen, Rowad, Paliwal: "A comparison of several techniques to determine the correct length on a high dose-rate, remote afterloader." *Med.Phys.* June 1996.

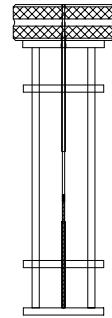
Prostate Brachytherapy Seed Calibrations



Individual Seed Calibration for Prostate Cancer Treatment

Source Holder for Single Seed Measurements, REF 70016 This insert has a 1.2mm inner diameter Teflon® tube which positions an individual iodine, palladium, iridium, or gold seed at the most sensitive area of the HDR 1000 Plus. The smooth Teflon tube allows easy removal of the seed.

This source holder can be calibrated for several iodine and palladium isotopes at the University of Wisconsin ADCL. Only one source holder needs to be purchased for these multiple calibrations.



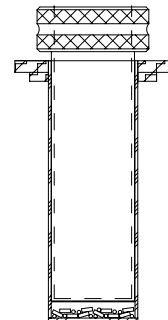
Batch Assay Measurements

Source Holder for Seed Batch Assay, REF 70022 LDR brachytherapy treatment for prostate cancer requires high numbers of seeds. A treatment center may receive up to 500 seeds if several cases are imminent. Individual seed calibration can be time consuming and cumbersome. TG-40, referenced above, recommends a random sampling of at least 10% of the seeds.

Source Holder 70022 provides multiple seed measurements for up to 500 of the iodine or palladium seeds typically used for prostate cancer treatment.

This Source Holder positions seeds at the most sensitive area of the HDR 1000 Plus. If you have Source Holder 70016 with an ADCL calibration for the isotope being measured, you may use that calibration in conjunction with Source Holder 70022.

Self absorption resulting from a large number of seeds being placed in the insert is significant. Because of this self absorption, correction factors must be experimentally obtained for each type of LDR seed used. This method is described in detail in *Med. Phys.* 22 (9) Sept. 1995. Note: a correction factor for iodine and palladium, as shown in Fig. 2 of this article, should be determined for each individual well chamber upon receipt of the chamber.



Independent Verification

Many manufacturers of brachytherapy seeds recommend independent verification of their source strengths. The AAPM does also, "Every institution practicing brachytherapy shall have a system for measuring source strength with secondary traceability for all source types used in its practice. Prior to using newly received sources for treatment, the vendor supplied (with the exceptions noted in the preceding paragraph) calibrations must be verified as per Task Group No. 40 recommendations. The institution should compare the manufacturer's stated value with the institution's standard". "Well-type ionization chambers make it easy to establish source calibrations with one of these traceabilities". From Code of practice for brachytherapy physics: Report of AAPM Radiation Therapy Committee Task Group No. 56. *Med. Phys.* 24(10), Oct. 1997.



Prostate Brachytherapy Seed Calibrations

Output Measurement of I-125 RAPID Strand™ Iodine Seeds

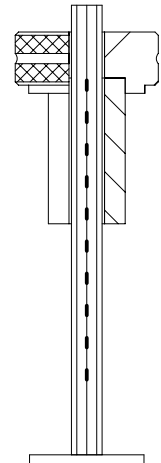
Source Holder for I-125 RAPID Strand™, REF 70023

- A fast and convenient method of performing a quality assurance measurement of your I-125 RAPID Strand™.
- The sterile insert maintains sterility of the I-125 RAPID Strand™.
- Five seeds are measured simultaneously.
- QA measurements within $\pm 5\%$ of calibrated IMC6711 I-125 Seeds™.
- Short term precision is $\leq 1\%$.
- No measurable rotational dependence.
- The complete calibration system is lightweight and easily portable for use in a sterile environment

The I-125 RAPID Strand™ Source Holder 70023 simultaneously measures five seeds at one end of the I-125 RAPID Strand™ while the I-125 RAPID Strand™ remains in the spacing jig. Invert the jig to measure the five seeds at the other end. The source holder itself can be sterilized.

To determine the activity of the I-125 RAPID Strand™, we provide a correction factor derived from an extensive evaluation of the HDR 1000 Plus and Source Holder 70023 containing an I-125 RAPID Strand™ with 10 seeds.

Following the evaluation, individual seeds were cut from the I-125 RAPID Strand™ and individually calibrated. These measurements were compared to the initial, collective seed measurement of the intact I-125 RAPID Strand™ in Source Holder 70023, and the correction factor calculated.

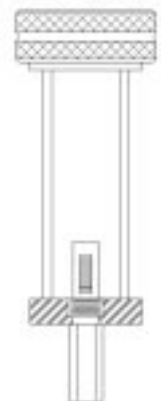


MICK™ Magazine Cartridges

Source Holder for Measurements of Loaded MICK™ Magazine Cartridges, REF 70024

- QA Measurements for Dose Verification
- No Rotational Dependence
- Fast Measurements
- Iodine or Palladium Seeds

The MICK™ Magazine Source Holder for the HDR 1000 Plus provides a quick and convenient QA measurement of loaded MICK™ Magazine Cartridges. This Source Holder positions the seeds at the center of the well chamber for quick, reproducible measurements.



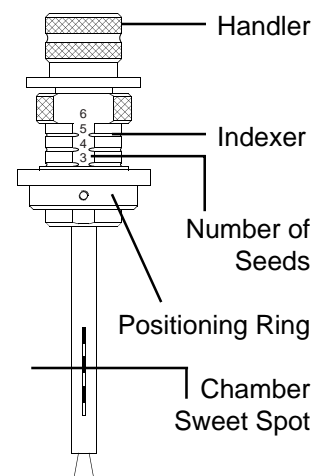
Low Dose Rate Brachytherapy Calibrations



Bard® EXPRESS Seeding Cartridge

- Quality Assurance measurements within 5% of calibrated seeds
- Measurement reproducibility better than 1%
- No rotational dependence
- A quick calculation provides the average seed activity

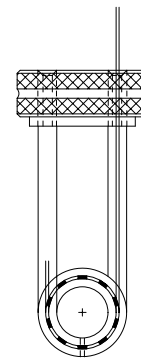
Source Holder for Bard® EXPRESS Seeding Cartridge, REF 70032 positions loaded cartridges at the most sensitive position of the HDR 1000 Plus, providing a check of the relative activity of the seed held within the cartridge. The source holder accommodates Bard® Seeding Cartridges with 2 to 6 seeds and can be gas or steam sterilized.



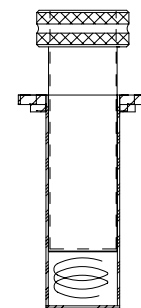
Bard is a registered trademark of C.R. Bard, Inc.

Low Dose Rate Iridium Source Holders

Source Holder for Low Dose Rate ¹⁹²Ir Ribbon Seeds, REF 70009 has a 3mm diameter acrylic tube which extends from the top of the insert to the most active area of the chamber. It makes one loop at the active area and extends back to the top of the insert. A collective calibration of the entire ribbon of seeds is obtained. Fourteen iridium seeds spaced one centimeter center to center can fit into the active area.



Source Holder for Measurement of Iridium Wire Coils, REF 70022
The iridium wire coil is placed in the tube and uniformly compressed to 2mm for measurement at the most sensitive point of the HDR 1000 Plus. This consistent positioning provides for excellent measurement reproducibility. Short term reproducibility is 0.6%. Linearity over a range of 124 to 2036 MBq is better than 0.1%.

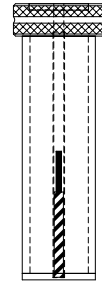




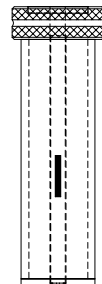
Low Dose Rate Brachytherapy Calibrations

Cesium Source Holders

Source Holder for Cesium, REF 70020 has a 5mm diameter opening and is commonly used with *manually loaded* cesium sources. A spacer within the source holder positions the cesium insert at the most active area of the chamber. The spacer for positioning the cesium source is removable so that the insert can also be used with some longer cesium sources, and with larger HDR ¹⁹²Ir catheters.

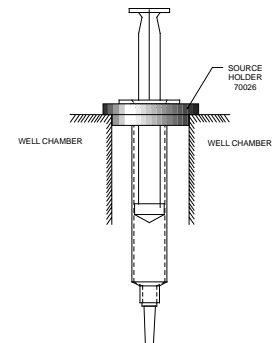


Source Holder for Cesium Remote Afterloading, REF 70003 has a 7.1mm diameter opening. This insert is used with LDR remote afterloading treatment systems. There is no spacer because the afterloading system positions the sources. This insert can also be used with cobalt sources used in some LDR remote afterloading treatment systems.

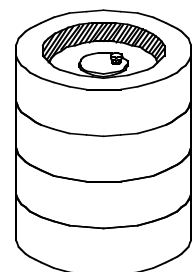


Other Products and Services

Source Holder for Measurement of Metastron™ (Strontium-89 Chloride Injection Samarium-153), REF 70026, provides a quick and convenient QA measurement of Metastron vials. Source Holder 70026 for 5cc and 10cc Metastron Syringes includes one set of two syringe holders, one for a 5cc syringe and one for a 10cc syringe.



One Inch Lead Shielding Ring, REF 70025, is made of one inch thick lead to surround the HDR 1000 Plus. It is constructed of four interlocking rings to shield the user during measurement.



Calibrations Standard Imaging offers NIST traceable calibrations from the University of Wisconsin Accredited Dosimetry Calibration Laboratory. You need only one purchase order to cover calibrations, shipping, handling, and service. Standard Imaging hand carries all instruments to the ADCL.

HDR 1000 Plus Source Holders



This table is provided for your convenience in identifying the proper Source Holder for use with the isotopes utilized by your facility.				
REF	Standard Imaging Source Holders	Isotopes For Holder	ADCL Calibrations Available	
			REF	Calibrations
70010	Source Holder for HDR Iridium 2.2 mm Opening	HDR Iridium	80010	HDR Iridium
70008	Quality Assurance Tool Insert	HDR Iridium	-	None
70020	Source Holder for Cesium 5 mm Opening	Cesium	80020	Cesium
70003	Source Holder for Cesium Remote Afterloading 7.1 mm Opening	Cesium	80020	Cesium
70009	Source Holder for LDR Iridium Ribbons	LDR Iridium	80025-A 80025-B	LDR Iridium, Alpha Omega Services Iridium, Best International
70016	Source Holder for Single LDR Seeds 1.2 mm Opening	LDR Iridium Iodine Palladium	80025-A 80025-B 80040 80035	Iridium, Alpha Omega Services Iridium, Best International Iodine (many available, see price list) Palladium (many available, see price list)
70022	Source Holder for LDR Seed Batch Assay	Iodine Palladium	-	None None
70023	Source Holder for I-125 RAPID® Strand Seeds	Iodine	-	None
70024	Source Holder for Mick® Cartridge	Iodine Palladium	-	None None
70022	Source Holder for LDR Iridium Wire Coil	Iridium Wire	-	None
70026	Source Holder for 5 cc and 10 cc Syringes	Metastron® Samarium	-	None None
70032	Source Holder for Bard® EXPRESS Seeding Cartridge	Palladium	-	None

NOTE: One source holder may have several calibrations associated with it. For example, a Source Holder for Single LDR Seeds REF 70016 may have calibrations for Iodine, Palladium and LDR Iridium.



HDR 1000 Plus Features and Specifications

ADCL Calibrations:	HDR ¹⁹² Ir and/or LDR radionuclides from various manufacturers as requested	
Active Volume:	245 cm ³	
Connector:	Two lug triax (standard) TNC, Type M, or BNC + Banana (optional)	
Range:	10U to 80MU 0.01mCi to 20Ci	
Cable:	1 meter (40 inches)	
Bias Voltage Applied:	+/- 300 volts, typical	
Leakage:	Less than 5 x 10 ⁻¹⁴ A	
Stability:	0.2% (Reproducibility over 2 years)	
Response:	+/-0.5% over 25mm at center of axis	
Sensitivity:		
Source:	Current to Air Kerma Strength U=1uGym ² /h	Current to Apparent Activity
HDR Iridium:	2.1 pA/U	8.6 nA/Ci
Cesium:	2.0 pA/U	5.6 nA/Ci
LDR Iridium:	2.3 pA/U	9.1 nA/Ci
Iodine:	4.3 pA/U	5.4 nA/Ci
Palladium:	2.1 pA/U	2.4 nA/Ci
A _{ion} :	0.9996, typical	
Case:	Wooden carrying case	
Dimensions:		
Height:	15.6 cm (6.1 inches)	
Diameter:	10.2 cm (4 inches)	
Insert Diameter:	3.5 cm (1.4 inches)	
Insert Height:	12.1 cm (4.8 inches)	
Weight:	2.7 kg (6.1 lbs)	

Specifications subject to change without notice.



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