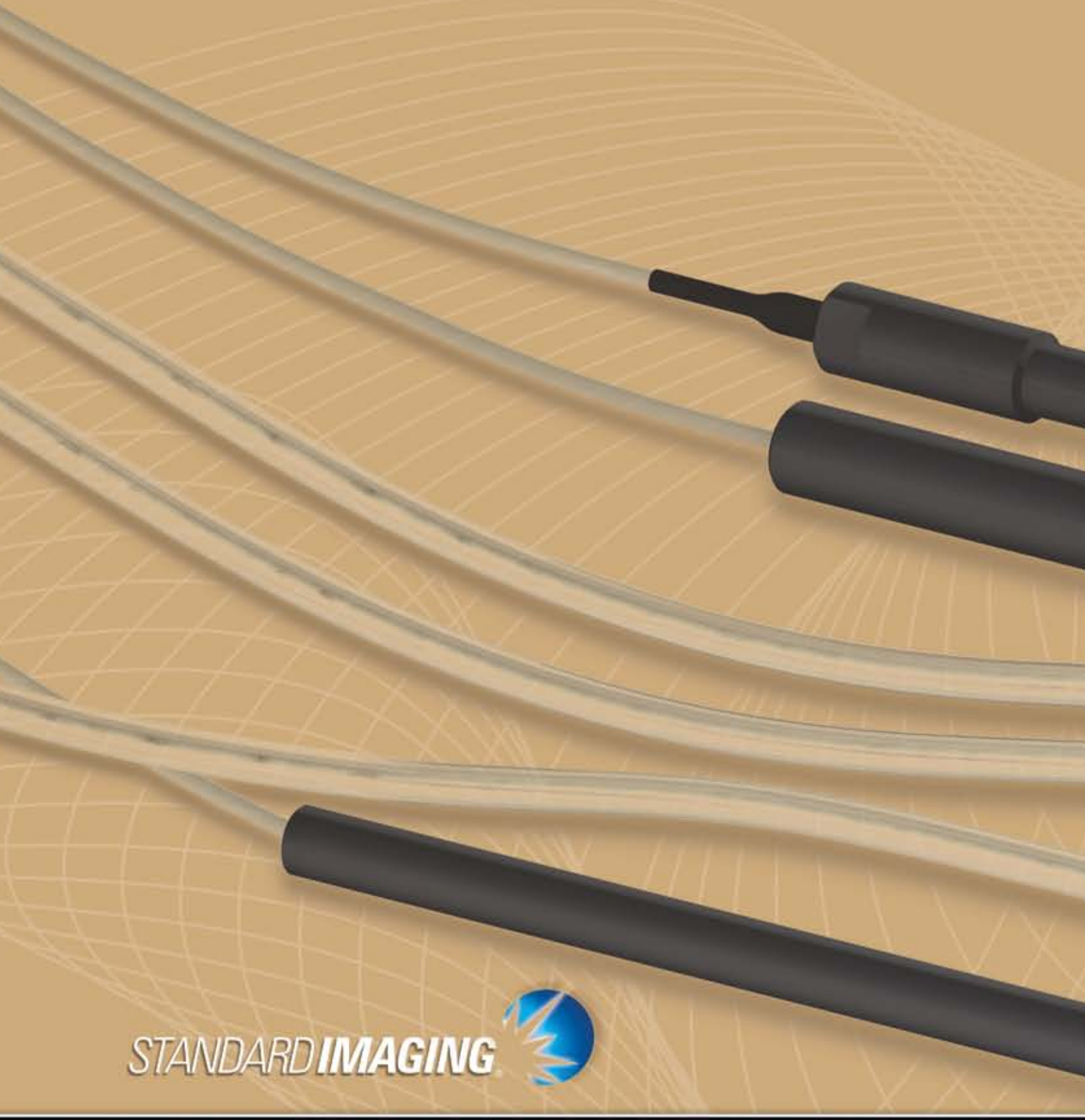


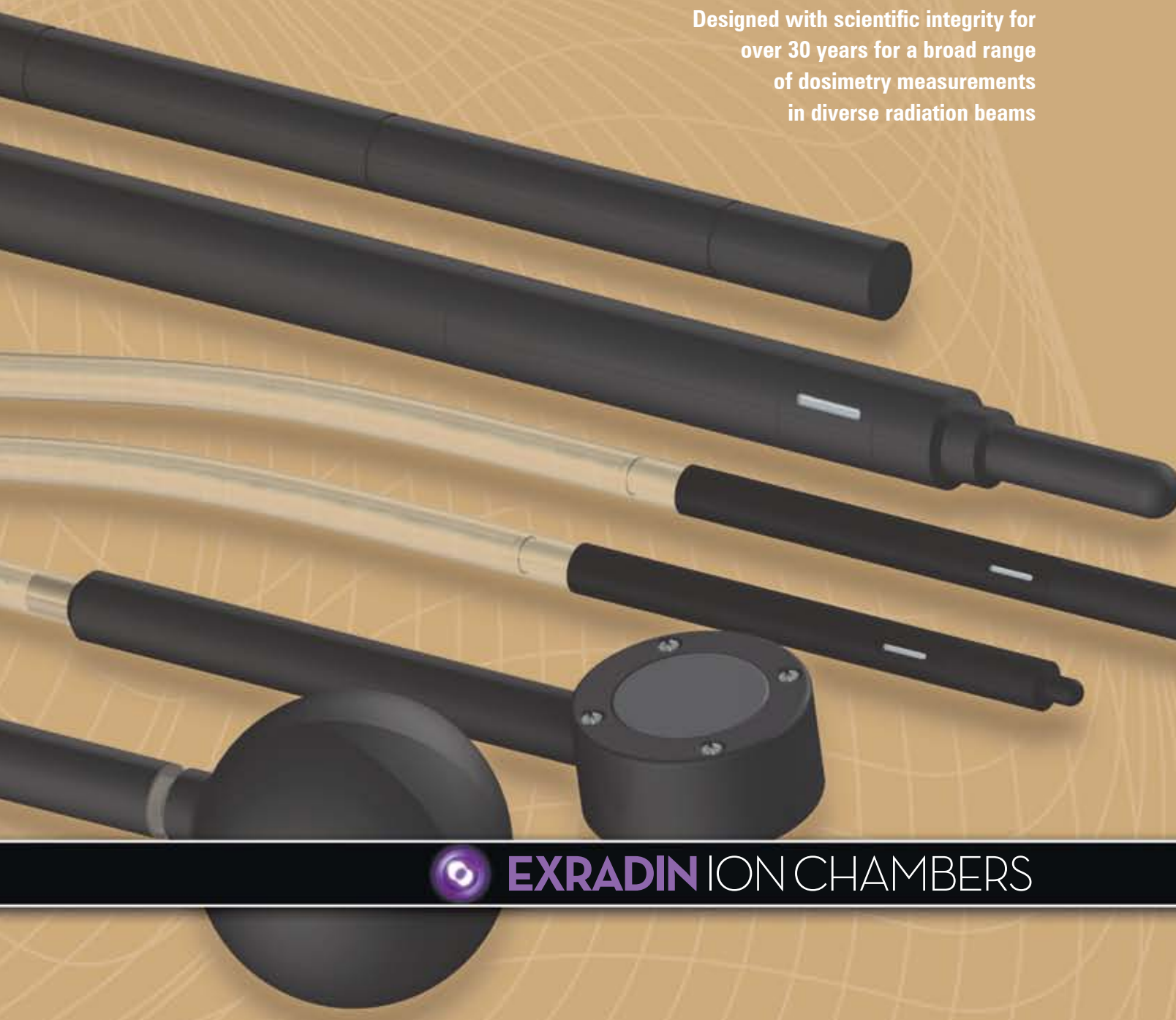
STANDARD IMAGING

www.**standardimaging**.com
800-261-4446 . PH 608-831-0025 . FAX 608-831-2202
3120 Deming Way Middleton WI 53562-1461 USA

 1180-21 (4.08)

UNCOMPROMISING **QUALITY**

Designed with scientific integrity for over 30 years for a broad range of dosimetry measurements in diverse radiation beams



EXRADIN ION CHAMBERS

Exradin Ion Chambers

Exradin (**EX**acting **RAD**iation **IN**strumentation) **Ion Chambers** have been built for over 33 years, are recognized by top research institutes and standards laboratories, and have a worldwide reputation for integrity and excellence. Since being acquired by Standard Imaging in 2000, the Exradin line has maintained the same standards for quality workmanship and continues the tradition of exacting precision.

What attributes make Exradin the smart choice?

Durable, Dependable and Reliable

- Construction material is durable and more robust than typical chambers (i.e. PMMA thimble tips), and therefore is more suitable for routine measurements
- Excellent inherent material conductivity eliminates the need for troublesome conductive coatings found in many other chambers, which can flake off and require very careful handling
- Inherently waterproof construction for use in most water tanks – eliminating the need for waterproofing sleeves or protective coatings
- The Model A12 Exradin Farmer-Type Chamber survived 3 drop tests from 1 meter high onto a hard floor without a change in calibration.

Stable behavior

- Proper guard design defines a consistent collecting volume with uniform field lines providing a stable and repeatable signal
- Exradin chambers feature some of the quickest settling times of any ion chamber manufacturer
- Exceptionally wide guard rings on all parallel plate chambers eliminate any perturbation volume effects

Accuracy through a proper, theoretically ideal design

- Only the guard defines the collecting volume
- Axially symmetric design, along with proper guard design, ensures a uniform isotropic response
- Collection efficiencies of 99.9% or better
- Chamber vents through a flexible tube surrounding the triaxial cable – vent tube is sealed to the chamber body and vents to the ambient near the connector; ideal for use in water or plastic phantoms
- All chamber models can handle up to 1000V of polarizing potential
- Homogeneous construction on most chambers – collector, guard and shell are made of same conductive material developed by Dr. Francis Shonka, the creator of A150 tissue-equivalent and C552 air-equivalent plastics

Quick response upon hookup

- Ionization currents may be read immediately after electrometer and extension cable transients subside because Exradin chambers do not exhibit voltage soakage or stem effect phenomena
- All chambers have leakages $< 10 \times 10^{-15}$ amps

Repairable

- Repairing a chamber can be a cost effective option to buying a new chamber if a thimble or entry window were to become damaged – Standard Imaging receives chambers for service that have been in the field for decades!

Other Exradin Benefits

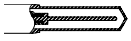
- Chambers constructed of Shonka conductive plastics, some available in three varieties – C552, D400 or A150
- Extensive build-up cap options are available for most chambers including homogenous C552, A150, D400, Delrin, and Brass
- Handsome wooden case included; protects chamber during storage and shipment

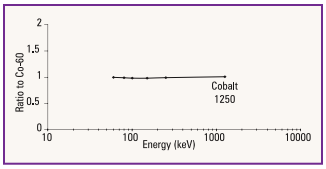
Farmer-type Chambers

- For absolute dosimetry calibrations in water, air or other phantom material
- Inherently waterproof construction for use in most water tanks — eliminating the need for waterproofing sleeves or protective coatings
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms
- Matching 2.8 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included for in-air measurements. Additional Delrin and brass build-up caps available

MODEL A19 EXRADIN CLASSIC FARMER-TYPE CHAMBER

— Collecting Volume: 0.62 cc

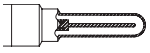


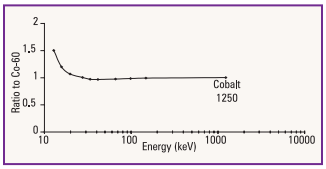


- Exterior classic Farmer-type chamber design assures the ion chamber will fit existing plastic phantom cavities, build-up caps, and standard cesium check sources
- Maintains the high quality internal design of the Model A12 Exradin Farmer-type Chamber
- One-piece, non-removable 4.6 cm stem made of black anodized aluminum styled after traditional Farmer-type chambers

MODEL A12 EXRADIN FARMER-TYPE CHAMBER

— Collecting Volume: 0.65 cc

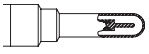


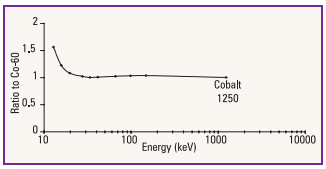


- Completely characterized in TG 51 & TRS 398
- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- The Model A12 Exradin Farmer-Type Chamber survived 3 drop tests from 1 meter high onto a hard floor without a change in calibration.

MODEL A12S EXRADIN FARMER-TYPE CHAMBER

— Collecting Volume: 0.25 cc





- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed

Rigorous one meter drop test proves ruggedness and reliability.

Micro Chambers

- For assessing pinpoint radiation fields for IMRT, orthovoltage, x-rays, stereotactic, and superficial skin therapy
- Inherently waterproof construction for use in most water tanks – eliminating the need for water-proofing sleeves or protective coatings
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms

MODEL A16 EXRADIN MICROCHAMBER

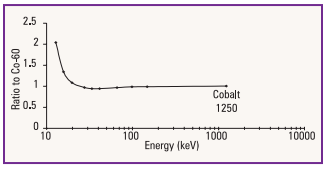
— Collecting Volume: 0.007 cc

- Capable of measuring extremely small field sizes of 3.4 x 3.4 mm — allowing for accurate measurements while minimizing partial volume effects
- Ideal, nearly-spherical collecting volume
- One-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Matching 2.5 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included for in-air measurements. Additional Delrin and brass build-up caps available

MODEL 14 & A14SL EXRADIN MICROCHAMBERS

— Collecting Volume: 0.016 cc

Models 14 & A14SL



- Capable of measuring extremely small field sizes of 4 x 6 mm — allowing for accurate measurements while minimizing partial volume effects
- Model 14 has two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- Model A14SL has one-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

Exradin MicroChambers are ideal for small field size IMRT applications.

Miniature Shonka **Thimble** Chambers

- For relative dosimetry scanning and measuring points in water, air or other phantom material
- Small volumes allow for excellent spatial resolution and exact characterization of a small area of the beam in depth dose measurements — can also be used for high energy photon and electron beam calibration
- Perfect balance between fast scanning speeds and accurate point dose measurements within 1 cm
- Inherently waterproof construction for use in most water tanks – eliminating the need for waterproofing sleeves or protective coatings
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms

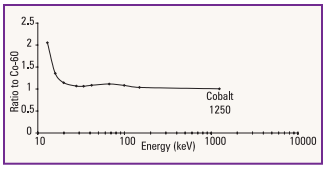
MODEL 1 & A1SL EXRADIN MINIATURE SHONKA THIMBLE CHAMBERS

— Collecting Volume: 0.057 cc

Model 1

Model A1SL

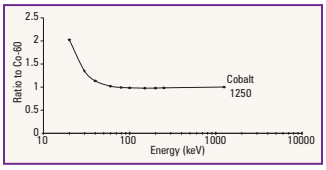
Models 1 & A1SL



- Model 1 has two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- Models A1 and T1 are characterized in TRS-398
- Model A1SL has one-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Cobalt-60, Delrin, and brass build-up caps available for in-air measurements

MODEL A18 EXRADIN MINIATURE SHONKA THIMBLE CHAMBER

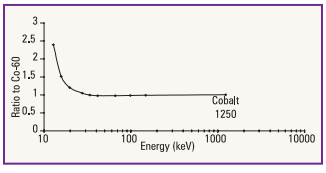
— Collecting Volume: 0.125 cc



- One-piece, non-removable 5.6 cm stem made of black anodized aluminum for use in plastic phantoms with small cavities or confined water tank mounting scenarios
- Matching 2.0 mm thick Cobalt-60 build-up cap of C552 Shonka air-equivalent plastic included

MODEL 2 EXRADIN MINIATURE SHONKA THIMBLE CHAMBER

— Collecting Volume: 0.54 cc



- Intended for exposure, air kerma measurement and facilitating the determination of absorbed dose water; ideal for routine beam calibration
- Suitable for pulsed radiation with excellent saturation characteristics
- Models A2 and T2 are characterized in TRS-398
- Two separate stem pieces of 5.1 cm and 12.7 cm can be coupled together for flexibility of operation and additional length when needed
- Cobalt-60 build-up cap available for in-air measurements

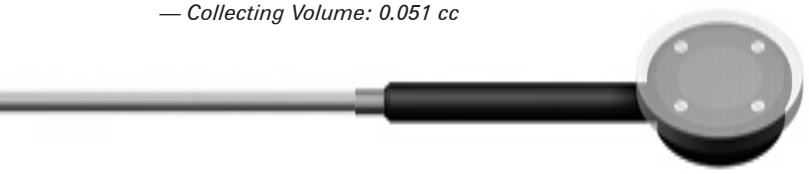
Exradin Thimble Chambers provide a perfect balance between fast scanning and point dose measurements.

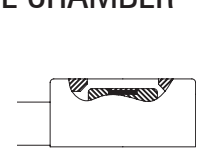
Parallel Plate Chambers

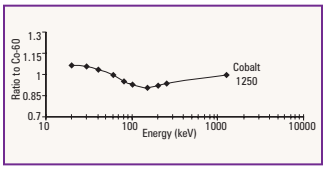
- Exceptionally wide guard rings ensure precision in depth-dose measurement with no perturbation in field lines even at low energies — exceeding the 3 mm width as recommended in TG-39
- Rigid stem allows accurate positioning of chamber
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in water or plastic phantoms

MODEL A10 EXRADIN MARKUS-TYPE PARALLEL PLATE CHAMBER

— Collecting Volume: 0.051 cc



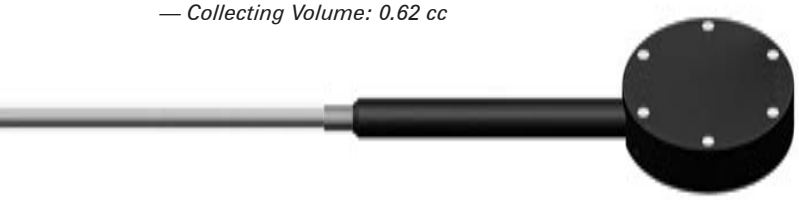


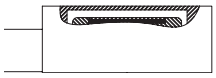


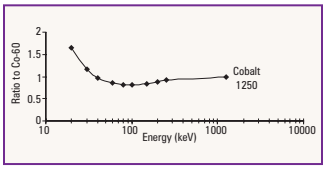
- Markus-type chamber for use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Capable of measuring at zero depth in build-up region of an electron field
- Markus-type design assures the ion chamber will fit existing plastic phantom cavities and build-up caps
- Ideally suited for smaller electron field measurements in a water tank — the Kapton film window is sealed by using the included 1.0 mm, TG-51 compliant, PMMA waterproofing cap
- Characterized for TRS-398†
- Cobalt-60 build-up cap available for in-air measurements

MODEL 11 EXRADIN SPOKAS PARALLEL PLATE CHAMBER

— Collecting Volume: 0.62 cc



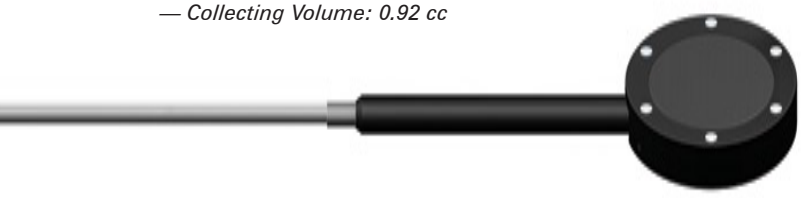


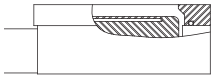


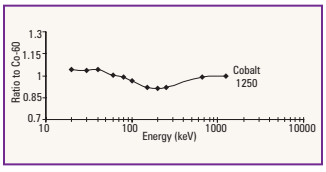
- For use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Ideally suited with larger volume for routine electron field measurements in a water tank — inherently waterproof, no additional waterproofing cap required
- Model P11 (D400 polystyrene-equivalent plastic version) is characterized in TG-51 and TRS-398
- Cobalt-60 build-up cap available for in-air measurements

MODEL 11TW EXRADIN SPOKAS PARALLEL PLATE CHAMBER

— Collecting Volume: 0.92 cc







- For use in routine electron beam measurements and for depth-dose studies in electron, photon, proton, and neutron beams
- Ideally suited for low energy x-rays, and mammography
- Waterproof while using the included 1.0 mm, TG-51 compliant, PMMA waterproofing cap over the Kapton film window
- Cobalt-60 build-up cap available for in-air measurements

continued on next page...

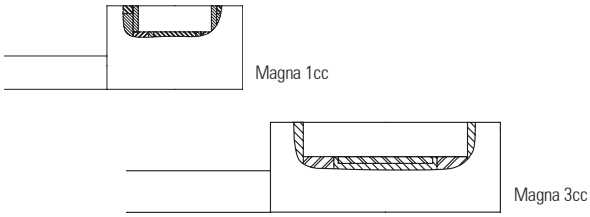
Exradin Parallel Plate Chambers are characterized for TG-51 and TG-398.

† Ref: Calculations for Plane-Parallel Ion Chambers in 60Co Beams Using the EGSnrc Monte Carlo Code, Med. Phys. 30 (2), February 2003

Parallel Plate Chambers *continued*

MAGNA 1CC & 3CC PARALLEL PLATE CHAMBERS

— Collecting Volume: 1.0 cc & 3.0 cc



- For use in all air kerma, absorbed dose, and exposure measurements
- Ideally suited for low energy x-rays and mammography
- Designed for in-air and phantom measurements

CT Chambers

- For performing the measurements necessary for calculating the CTDI, as described in TG-74, Quality Control in Diagnostic Radiology
- Fiducial markers identify center and both ends of the collecting volume providing easy setup in relation to the beam
- Body tube and guard constructed of C552 Shonka air-equivalent conducting plastic, providing robust design and excellent conductivity — eliminates fragility or flaking of painted conductive layers found in many chambers

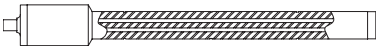
MODEL A101 EXRADIN CT CHAMBER

— Collecting Volume: 4.6 cc

- Excellent response uniformity over the central 10 cm of chamber length — variation less than ± 3%
- An acrylic sheath is included for use in phantoms that have a typical 13.1 mm cavity
- Designed for in-air and phantom measurements

MODEL A17 EXRADIN CT CHAMBER

— Collecting Volume: 1.91 cc



- Provides an extremely flat response within ± 1.5% across its active length of 8 cm without polarity or perturbation effects
- Inherently waterproof, the Model A17 is a unique CT ion chamber used for checking the consistency of the beam at various jaw widths
- Designed for helical tomotherapy measurements
- Chamber vents through a flexible tube surrounding the triaxial cable — vent tube is sealed to the chamber body and open near the connector; ideal for use in phantoms
- Inherent Cobalt-60 build-up cap built into wall thickness
- 6MV in-air buildup cap available

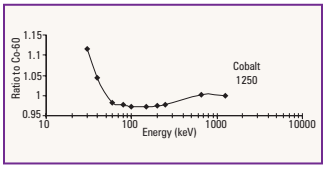
Exradin CT Ion Chambers combine robust design with uniform energy response.

Shonka-Wyckoff **Spherical** Chambers

- For calibration laboratories, research applications, manufacturing, and accelerator room scatter measurements
- Precise in-air measurements from multiple fields without moving the chamber
- Obtain accurate measurements in any direction without absorption of the radiation by the body of the chamber
- Spherical volume chambers are easily centered for precise positioning resulting in accurate measurements
- Rugged design with 9" integral rigid stem for easy, precise positioning

MODEL A3 EXRADIN SHONKA-WYCKOFF SPHERICAL CHAMBER

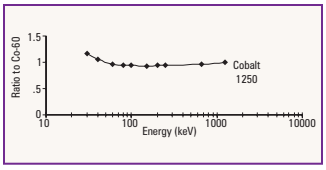
— Collecting Volume: 3.6 cc



- Extended energy range through the use of available build-up cap

MODEL A4 EXRADIN SHONKA-WYCKOFF SPHERICAL CHAMBER

— Collecting Volume: 30 cc



- Extended energy range through the use of available build-up cap

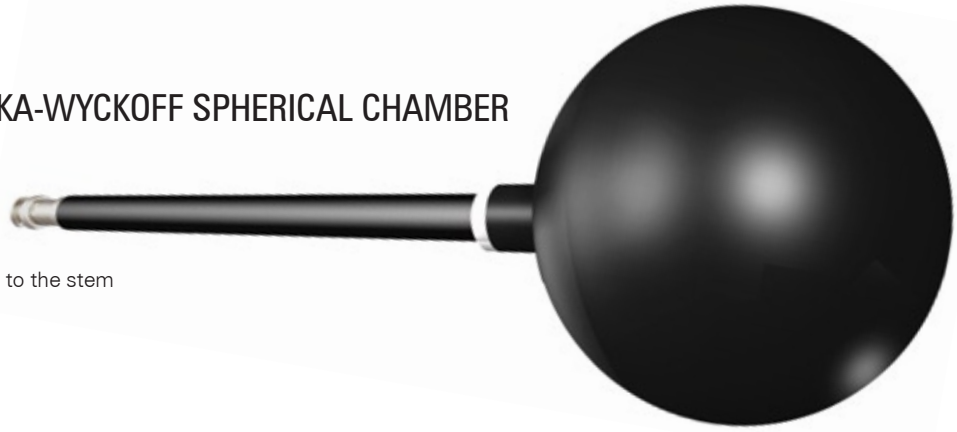
MODEL A5 EXRADIN SHONKA-WYCKOFF SPHERICAL CHAMBER

— Collecting Volume: 100 cc

- Inherent Cobalt-60 build-up cap built into wall thickness
- Triaxial BNC connector mounted to the stem

MODEL A6 EXRADIN SHONKA-WYCKOFF SPHERICAL CHAMBER

— Collecting Volume: 800 cc



- Inherent Cobalt-60 build-up cap built into wall thickness
- Triaxial BNC connector mounted to the stem

Shonka-Wyckoff Spherical Chambers are relied upon by standards laboratories throughout the world.

EXRADIN Ion Chambers Product Matrix

	FARMER-TYPE CHAMBERS			MICROCHAMBERS			MINIATURE SHONKA THIMBLE CHAMBERS			
MODEL	**A19**	**A12**	**A12S**	**14**	**A14SL**	**A16**	**1**	**A1SL**	**2**	**18**
Collecting Volume	0.62 cc	0.65 cc	0.25 cc	0.016 cc	0.016 cc	0.007 cc	0.057 cc	0.057 cc	0.54 cc	0.125 cc
Centroid of Collecting Volume from exterior tip of shell	13.0 mm	12.9 mm	5.8 mm	~2.0 mm	~2.1 mm	~1.7 mm	4.0 mm	4.1 mm	7.0 mm	5.3 mm
Centroid of Collecting Volume from exterior surface of window										
Outside Diameter of Shell Collecting Volume	7.1 mm	7.1 mm	7.1 mm	6.0 mm	6.35 mm	3.4 mm	6.0 mm	6.35 mm	11.4 mm	6.9 mm
Inside Diameter of Shell Collecting Volume	6.1 mm	6.1 mm	6.1 mm	4.0 mm	4.0 mm	2.4 mm	4.0 mm	4.0 mm	9.5 mm	4.9 mm
Window Collector Gap										
Shell Wall Thickness	0.5 mm	0.5 mm	0.5 mm	1.0 mm	1.1 mm	0.5 mm	1.0 mm	1.1 mm	1.0 mm	1.0 mm
Collector Diameter	1.0 mm	1.0 mm	1.0 mm	0.3 mm	0.3 mm	0.3 mm	1.0 mm	1.0 mm	4.6 mm	1.0 mm
Guard Ring Width (Radial)										
Collector Length	21.6 mm	21.6 mm	7.5 mm	1.5 mm	1.5 mm	1.27 mm	4.4 mm	4.4 mm	8.4 mm	6.4 mm
Window Material*										
Window Thickness										
Window or Support Rings, Collector and Guard Material*										
Shell, Collector and Guard Material*	A	A	A	A, T	A	A	A, T	A	A, P, T	A
Nominal Air Kerma Calibration Factor†	45 Gy/μC	45 Gy/μC	120 Gy/μC	2.5 Gy/nC	2.5 Gy/nC	3.5 Gy/nC	550 Gy/μC	550 Gy/μC	55 Gy/μC	230 Gy/μC
Nominal Leakage	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps
Maximum Polarizing Voltage	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts
Waterproof	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Included Buildup Cap	Co-60	Co-60	Co-60	None	None	Co-60	None	None	None	Co-60

* ***MATERIAL:*** ***A*** *– C552 Shonka air-equivalent plastic* ***P*** *– D400 polystyrene-equivalent plastic* ***T*** *– A150 Shonka tissue-equivalent plastic*

† *Nominal calibration factor for Co-60*

CT IONCHAMBERS		SHONKA-WYCKOFF SPHERICAL ION CHAMBERS				PARALLEL PLATE ION CHAMBERS				
101	**17**	**A3**	**A4**	**A5**	**A6**	**A10**	**11**	**11TW**	**Magna 1 cc**	**Magna 3 cc**
4.6 cc	1.91 cc	3.6 cc	30 cc	100 cc	800 cc	0.051 cc	0.62 cc	0.92 cc	1.0 cc	3.0 cc
						1.0 mm	2.0 mm	1.5 mm	4.0 mm	4.0 mm
10.0 mm	12.7 mm	19.6 mm	39.1 mm	63.1 mm	120.4 mm					
8.0 mm	6.0 mm	19.1 mm	38.1 mm	57.2 mm	114.4 mm					
						2.0 mm	2.0 mm	3.0 mm	7.95 mm	7.95 mm
1.0 mm	3.3 mm	0.25 mm	0.5 mm	3.0 mm	3.0 mm					
2.5 mm	2.5 mm	2.1 mm	4.1 mm	6.5 mm	11.6 mm	5.4 mm	20.0 mm	20.0 mm	12.7 mm	21.9 mm
						4.3 mm	4.4 mm	4.4 mm	3.9 mm	7.6 mm
100 mm	80 mm	13.3 mm	24.9 mm	37.3 mm	74.0 mm					
						3.86 mg/cm^2 Kapton	1.0 mm, A, P, or T	3.86 mg/cm^2 Kapton	3.86 mg/cm^2 Kapton	3.86 mg/cm^2 Kapton
						0.05 mm	1.0 mm	0.05 mm	0.05 mm	0.05 mm
						A	A, P, T	A, P, T	A	A
A	A	A	A	A	A					
5.2 Gy/μC	1.2 R/nC	0.9 R/nC	0.09 R/nC	0.03R/nC	0.004R/nC	530 Gy/μC	48 Gy/μC	30 Gy/μC	180 Gy/μC	2.1 R/μC
$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-15}$ amps	$<10^{-14}$ amps	$<10^{-14}$ amps
1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	1000 volts	400 volts	400 volts
No	Yes	No	No	No	No	Yes, with included cap	Yes	Yes, with included cap	No	No
Acrylic sleeve	Co-60 integral	None	None	Co-60 integral	Co-60 integral	1.0 mm acrylic, TG-51 Compliant	None	1.0 mm acrylic, TG-51 Compliant	None	None