UNCOMPROMISING QUALITY

The standard in dosimetry measurements for over 35 years.
A Global **Reputation for Excellence**

For over 35 years top research institutes and standards laboratories world-wide have used Exradin Detectors for a broad range of dosimetry measurements in diverse radiation environments.

The Exradin line continues to build upon vetted ion chambers like the Exradin A12 and Exradin A1 with innovative tools such as the W1 Scintillator. Our passion for metrology, expertise in engineering and dedication to durability ensures that each detector we produce embodies this tradition of quality workmanship and exacting precision.
The **Exradin Advantage**

**Better Components**
- Waterproof construction eliminates the need for sleeves or protective coatings.
- Robust materials are more durable than typical chambers (i.e. PMMA thimble tips), and therefore are more suitable for routine measurements.
- Excellent inherent conductivity negates the need for coatings found in other chambers, which can flake off and require careful handling.
- Collector, guard and shell are made of conductive material developed by Dr. Francis Shonka, the creator of A150 tissue-equivalent, C552 air-equivalent and D400 polystyrene-equivalent plastics.

**Unmatched Durability**
- An Exradin A12 farmer-type chamber survived three 1 meter drop tests onto a hard floor, in three different orientations, without a change in calibration.*

**Superior Stability**
- Advanced guard design creates a consistent collecting volume with uniform field lines, providing a stable, repeatable signal.
- Exradin detectors feature some of the quickest settling times of any manufacturer.
- Exceptionally wide guard rings on all parallel plate chambers eliminate perturbation volume effects.

**Ideal Design for Improved Accuracy**
- The Collecting volumes of Exradin Ion Chambers are defined by the guard, not an insulator, creating a significantly more stable signal than competing detectors.
- Axially symmetric design ensures a uniform isotropic response.
- Collection efficiencies of 99.9% or greater.
- Chamber vents through a flexible tube surrounding the triaxial cable; ideal for use in water or plastic phantoms.
- Homogeneous construction on most chambers.

**Quick Response upon Hookup**
- Ionization currents can be read immediately after electrometer and extension cable transients subside because Exradin Ion Chambers do not exhibit voltage soakage or stem effect.
- Exradin chambers typically have $\pm 10 \times 10^{-15}$ amp leakage.

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Strict manufacturing tolerances and waterproof construction make Exradin Thimble Ion Chambers ideal for dosimetry calibrations in water, air and other phantom materials.

**EXRADIN A19 ION CHAMBER 0.62 cc Classic Farmer®**

The A19 fits existing plastic phantom cavities and build-up caps, limiting perturbation and minimizing settling time in absolute dosimetry calibration. This chamber is characterized for TG-51 procedures.

**EXRADIN A12 ION CHAMBER 0.64 cc Farmer-type**

Characterized in TG-51 and TRS-398, the A12 has fast settling time and a removable stem for superior absolute dosimetry calibrations in water, air or phantoms.

**EXRADIN A12S ION CHAMBER 0.24 cc Farmer-type**

The A12S is designed for absolute dosimetry calibrations in water, air or phantoms. The collector of the A12S is approximately one-third the size of the A12, confining collecting volume to the tip of the chamber.

**EXRADIN A2 ION CHAMBER 0.53 cc Spokas – P2, T2 also available**

The A2 is ideal for precise measurement of exposure and air kerma in photon beams and absorbed dose in photon, electron, proton and other beams. This chamber is available in air, polystyrene and tissue equivalent plastic. It is also available in magnesium with gas flow capabilities.

Rigorous one meter drop test proves ruggedness and reliability.
EXRADIN A1SL ION CHAMBER 0.053 cc Slimline Miniature Shonka

The A1SL, available in air or tissue equivalent plastic, provides a perfect balance between fast scanning and point-dose measurements within 1cm in water, air or phantom materials. This chamber is characterized for TG-51 procedures.

EXRADIN A1 ION CHAMBER 0.053 cc Miniature Shonka – T1 also available

The Exradin A1 has the same internal dimensions and collecting volume as the A1SL, yet the larger diameter is ideal for use in solid phantoms. This chamber is characterized in TG-51 and TRS-398.

EXRADIN A28 ION CHAMBER 0.125 cc Scanning

The Model A28 Chamber features exceptional omni-directional spatial resolution for relative dosimetry scanning in water phantoms and use in minute field measurements.
MICRO ION CHAMBERS

Superior small-field dosimetry to assess pinpoint radiation in IMRT, stereotactic, orthovoltage, x-rays and superficial skin therapy.

EXRADIN A16 ION CHAMBER 0.007 cc Micropoint

The Model A16 microchamber measures extremely small field sizes (3.4 mm x 3.4 mm); allowing for exceptional spatial resolution and exact pinpoint beam profile characterization. These attributes make the A16 ideal for stereotactic radiosurgery and IMRT applications.

EXRADIN A14SL ION CHAMBERS 0.015 cc Slimline Microchamber

The Model A14SL is capable of measuring extremely small field sizes of 4 mm by 6 mm, allowing for exceptional spatial resolution and exact pinpoint beam profile characterization. This helps assess radiation fields during IMRT and stereotactic radiosurgery.

EXRADIN A14 ION CHAMBERS 0.015 cc Microchamber – T14, also available

The Model A14 microchamber has the exact internal dimensions and collecting volume as the Model A14SL, yet a larger diameter is ideal for use in solid phantoms.
**CT ION CHAMBERS**

Exradin CT Chambers are durable detectors for performing the measurements necessary in the CTDI (computed tomography dose index) calculations described in TG-74.

**EXRADIN A101 ION CHAMBER 4.54 cc CT**

The A101 performs the measurements necessary for calculating the CTDI as described in TG-74. It has excellent response uniformity over the chamber length, with variation less than ±3%.

**EXRADIN A17 ION CHAMBER 1.91 cc Slice Therapy**

The A17 is tailored for MV and tomotherapy applications such as weekly QA checks or patient dose verification with phantoms and water tanks. It has excellent response uniformity over the chamber length, with variation less than ±1.5%.
PARALLEL PLATE CHAMBERS

Exradin Parallel Plate Chambers ensure precision in depth-dose measurements by providing uniform field lines even at low energies.

**EXRADIN A10 ION CHAMBER 0.050 cc Markus®-type Parallel Plate**

The A10 Markus-type chamber provides excellent spatial resolution for dose distribution measurements in a water phantom. An acrylic waterproof cap is included with this chamber for use in TG-51 electron beam protocols.

**EXRADIN A11 ION CHAMBER 0.62 cc Parallel Plate – T11, P11 also available**

Waterproof A11 Roos-type chamber may be operated while fully submerged without any protective sheath; ideal for repeated TG-51/TRS-398 dose distribution measurements in a water phantom.

**EXRADIN A11TW ION CHAMBER 0.93 cc Thin Window Parallel Plate – T11TW, P11TW also available**

The A11TW is tailored for use in superficial therapy and low energy diagnostic beams. The thin-window design provides nearly constant response over the entire diagnostic energy range.

The Exradin P11 Parallel Plate Chamber is characterized for TG-51 and TG-398.
**EXRADIN MAGNA A600 ION CHAMBER** 1.50 cc Diagnostic Parallel Plate

The A600 chamber is designed for consistent air kerma, absorbed dose and exposure measurements. Vented and fully-guarded, this chamber is perfectly suited for mammography and general diagnostic x-ray regions.

**EXRADIN MAGNA A650 ION CHAMBER** 3.46 cc Diagnostic Parallel Plate

The A650 chamber is a vented and fully guarded ion chamber for use in mammography and general diagnostic energy x-ray regions.

**EXRADIN A20 ION CHAMBER** 0.074 cc Low Energy X-Ray

The A20 is a low-energy x-ray chamber for assessing and calibrating pinpoint radiation fields for x-rays, stereotactic and TG-61 compliant superficial skin therapy.
Exradin Spherical Ion Chambers are relied upon by standards laboratories worldwide for precise measurement of radiation exposure and exposure rates. They are easily positioned and are excellent for in-air measurements.

**Exradin A3 Ion Chamber**

3.6 cc collecting volume is ideal for laboratory transfer standards and secondary standards for exposure measurements.

**Exradin A4 Ion Chamber**

30 cc collecting volume is ideal for laboratory transfer standards, secondary standards for exposure measurement and integrating exposure over a large area.

**Exradin A5 Ion Chamber**

100 cc collecting volume is ideal for secondary standards for exposure measurement, integrating exposure over a large area and room scatter measurements.
EXRADIN A6 ION CHAMBER 800 cc Shonka-Wyckoff Spherical

800cc collecting volume is ideal for secondary standards for exposure measurements, integrating exposure over a large area and room scatter measurements.

EXRADIN A8 ION CHAMBER 15.7 liter Shonka-Wyckoff Spherical

15.7 liter collecting volume is ideal for secondary standards for extremely low exposure measurements, integrating exposure over a large area and room scatter measurements.
The Exradin W1 Scintillator is a near-water equivalent detector that achieves paramount precision by significantly decreasing beam disturbance.

**Minimize Beam Perturbation and Corrections**

The unprecedented characteristics of the W1 Scintillator closely mimic water, easing data collection by negating many measurement corrections required with other detectors.

- Near water equivalence (within 5% of physical density)
- Linear dose response
- Dose rate independence
- Energy independence within the MV range
- Minimal temperature dependence

**Ideal for Measurement and Characterization of Small Fields**

1mm spatial resolution makes the W1 a perfect tool for stereotactic radiosurgery (SRS) and stereotactic body radiation therapy (SBRT) QA. This includes compatibility with the Lucy 3D QA Phantom and use in the following systems:

- Gamma Knife®
- CyberKnife®
- BrainLab®

**Automatically Correct for Cherenkov Effect**

Pair the W1 Scintillator with the SuperMAX Electrometer to effectively eliminate Cherenkov effect without the need for extraneous hand calculations.

**Consistent, Convenient Setup**

Integration with the Exradin Scintillator Calibration Slab and solid water phantoms allows for easy, repeatable measurements.
EXRADIN D1H & D1V DIODES

The Exradin D1V and D1H Diodes maximize spatial resolution and minimize angular dependence, allowing for consistent, accurate small-field stereotactic measurements.

Why use an Exradin Diode?
Exradin diodes produce flatter profiles and sharper resolution with a smaller active measurement area than traditional ion chambers. This allows for the precise measurement of minute fields while still achieving high visibility of the beam’s penumbra.

Specialized for Small Fields
The Exradin D1V and D1H Diodes facilitate several measurement modalities in small fields.
- The diode face of the D1V is perpendicular to the beam when upright, making it ideal for photon scanning applications and use in water phantoms and the Lucy 3D QA Phantom.
- The diode face of the D1H is perpendicular to the beam when flat, for use inside traditional plastic phantoms.

Both the D1V and D1H provide superior measurement of field sizes up to 20 x 20 cm² with excellent spatial resolution and minimal noise.

Minimize Angular Dependence
A common problem when performing measurements using diode-based detectors is angular dependence or significant variation in signal depending on the orientation of the detector. Exradin diodes help minimize this concern with less than 0.5% angular dependence when tilted up to 20° to the beam, providing more confidence in your results when measuring the penumbra or edge of the beam.
## EXRADIN ION CHAMBERS Product Matrix

<table>
<thead>
<tr>
<th>MODEL</th>
<th>1</th>
<th>A1SL</th>
<th>2</th>
<th>A18</th>
<th>A28</th>
<th>A19</th>
<th>A12</th>
<th>A12S</th>
<th>A101</th>
<th>A17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collecting Volume</strong></td>
<td>0.053 cc</td>
<td>0.053 cc</td>
<td>0.53 cc</td>
<td>0.123 cc</td>
<td>0.125 cc</td>
<td>0.62 cc</td>
<td>0.64 cc</td>
<td>0.24 cc</td>
<td>4.54 cc</td>
<td>1.91 cc</td>
</tr>
<tr>
<td><strong>Centroid of Collecting Volume</strong></td>
<td>from exterior tip of shell</td>
<td>3.86 mm</td>
<td>4.06 mm</td>
<td>6.96 mm</td>
<td>5.26 mm</td>
<td>4.47 mm</td>
<td>13.0 mm</td>
<td>12.9 mm</td>
<td>5.79 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Centroid of Collecting Volume</strong></td>
<td>from exterior surface of window</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outside Diameter of Shell Collecting Volume</strong></td>
<td>6.0 mm</td>
<td>6.35 mm</td>
<td>11.4 mm</td>
<td>6.9 mm</td>
<td>8 mm</td>
<td>7.1 mm</td>
<td>7.1 mm</td>
<td>7.1 mm</td>
<td>10.0 mm</td>
<td>12.7 mm</td>
</tr>
<tr>
<td><strong>Inside Diameter of Shell Collecting Volume</strong></td>
<td>4.0 mm</td>
<td>4.0 mm</td>
<td>9.5 mm</td>
<td>4.9 mm</td>
<td>5.8 mm</td>
<td>6.1 mm</td>
<td>6.1 mm</td>
<td>6.1 mm</td>
<td>8.0 mm</td>
<td>6.0 mm</td>
</tr>
<tr>
<td><strong>Window Collector Gap</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shell Wall Thickness</strong></td>
<td>1.0 mm</td>
<td>1.1 mm</td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>1.1 mm</td>
<td>0.5 mm</td>
<td>0.5 mm</td>
<td>0.5 mm</td>
<td>1.0 mm</td>
<td>3.3 mm</td>
</tr>
<tr>
<td><strong>Collector Diameter</strong></td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>4.6 mm</td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>1.0 mm</td>
<td>2.5 mm</td>
<td>2.5 mm</td>
</tr>
<tr>
<td><strong>Guard Ring Width (Radial)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Collector Length</strong></td>
<td>4.4 mm</td>
<td>4.4 mm</td>
<td>8.4 mm</td>
<td>6.4 mm</td>
<td>6.4 mm</td>
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<td>21.6 mm</td>
<td>7.5 mm</td>
<td>100 mm</td>
<td>90 mm</td>
</tr>
<tr>
<td><strong>Window Material</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Window Thickness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shell/Entry Window, Collector and Guard Material</strong>*</td>
<td>A, T</td>
<td>A</td>
<td>A, P, T</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td><strong>Nominal Air Kerma Calibration Factor</strong></td>
<td>5.4E+8 Gy/C</td>
<td>5.4E+8 Gy/C</td>
<td>5.4E+7 Gy/C</td>
<td>2.3E+8 Gy/C</td>
<td>2.3E+8 Gy/C</td>
<td>4.5E+7 Gy/C</td>
<td>4.4E+7 Gy/C</td>
<td>1.2E+8 Gy/C</td>
<td>6.2E+6 Gy/C</td>
<td>1.5E+7 Gy/C</td>
</tr>
<tr>
<td><strong>Recommended Polarizing Voltage</strong></td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
<td>300 V</td>
</tr>
<tr>
<td><strong>Nominal Leakage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>± 10 x 10^-15 amp</td>
</tr>
<tr>
<td><strong>Maximum Polarizing Voltage</strong></td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
</tr>
<tr>
<td><strong>Waterproof</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Included Buildup Cap</strong></td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>Co-60</td>
<td>Co-60</td>
<td>Co-60</td>
<td>Co-60</td>
<td>Co-60</td>
<td>None (1)</td>
<td>Co-60 integral</td>
</tr>
</tbody>
</table>

---

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

† Nominal calibration factor for Co-60 at 22° C

(1) comes included with an acrylic sleeve to adapt chamber to fit Ø0.50 in (12.7 mm) phantom holes

(2) waterproofing cap is PMMA, 1.0mm entry window, TG-51 compliant
<table>
<thead>
<tr>
<th>MICRO ION CHAMBERS</th>
<th>PARALLEL PLATE ION CHAMBERS</th>
<th>SPHERICAL ION CHAMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 A14SL A16</td>
<td>A10 11 11TW A20 Magna A600 Magna A650</td>
<td>A3 A4 A5 A6 A8</td>
</tr>
<tr>
<td>0.015 cc 0.015 cc 0.007 cc</td>
<td>0.050 cc 0.62 cc 0.93 cc 0.074 cc 1.50 cc 3.46 cc</td>
<td>3.6 cc 30 cc 100 cc 800 cc 15.7 L</td>
</tr>
<tr>
<td>2.21 mm 2.39 mm 1.65 mm</td>
<td>1.0 mm 2.0 mm 1.5 mm 1.8 mm 4.0 mm 4.0 mm</td>
<td>19.6 mm 39.1 mm 63.1 mm 120.4 mm 323.2 mm</td>
</tr>
<tr>
<td>6.0 mm 6.35 mm 3.4 mm</td>
<td>4.0 mm 4.0 mm 2.4 mm</td>
<td>19.1 mm 38.1 mm 57.2 mm 114.4 mm 311.2 mm</td>
</tr>
<tr>
<td>4.0 mm 2.0 mm 0.5 mm</td>
<td>2.0 mm 2.0 mm 3.0 mm 5.0 mm 7.95 mm 7.95 mm</td>
<td></td>
</tr>
<tr>
<td>1.0 mm 1.1 mm 0.5 mm</td>
<td>0.25 mm 0.5 mm 3.0 mm 3.0 mm 6.0 mm</td>
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</tr>
<tr>
<td>0.3 mm 0.3 mm 0.3 mm</td>
<td>5.4 mm 20.0 mm 20.0 mm 1.93 mm 12.7 mm 21.9 mm 2.1 mm 4.1 mm 6.5 mm 11.6 mm 22.4 mm</td>
<td></td>
</tr>
<tr>
<td>4.3 mm 4.4 mm 4.4 mm</td>
<td>4.3 mm 4.4 mm 1.2 mm 3.9 mm 7.6 mm</td>
<td></td>
</tr>
<tr>
<td>1.5 mm 1.5 mm 1.27 mm</td>
<td>13.3 mm 24.9 mm 37.3 mm 74.0 mm 166.7 mm</td>
<td></td>
</tr>
<tr>
<td>SHELL ONLY</td>
<td>3.86 mg/cm² Kapton</td>
<td>3.86 mg/cm² Kapton</td>
</tr>
<tr>
<td>A, T</td>
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<td>7.72 mg/cm² Kapton</td>
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<td>A, T</td>
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<td>3.86 mg/cm² Kapton</td>
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<tr>
<td>A, T</td>
<td>0.05 mm 1.0 mm 0.05 mm 0.09 mm 0.05 mm 0.05 mm</td>
<td></td>
</tr>
<tr>
<td>1.9E+9 Gy/C 1.9E+9 Gy/C 4.1E+9 Gy/C</td>
<td>5.6E+8 Gy/C 4.6E+7 Gy/C 3.0E+7 Gy/C 3.8E+8 Gy/C 1.9E+7 Gy/C 8.2E+6 Gy/C 9.0E+8 R/C 1.1E+8 R/C 3.3E+7 R/C 4.2E+6 R/C 2.1E+5 R/C</td>
<td></td>
</tr>
<tr>
<td>300 V 300 V 300 V</td>
<td>300 V 300 V 300 V 300 V 300 V 300 V 300 V 300 V 500 V 800 V 1000 V 1000 V</td>
<td></td>
</tr>
</tbody>
</table>

± 10 x 10⁻¹⁵ amp

<table>
<thead>
<tr>
<th>1000 V 1000 V 1000 V</th>
<th>1000 V 1000 V 1000 V</th>
<th>1000 V 1000 V 1000 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes Yes Yes</td>
<td>Yes, with included cap (2) Yes, with included cap (2)</td>
<td>No No No</td>
</tr>
<tr>
<td>None None Co-60</td>
<td>None None None</td>
<td>None None None</td>
</tr>
<tr>
<td>Co-60 integral Co-60 integral Co-60 integral</td>
<td></td>
<td></td>
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</tbody>
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