WATER PHANTOM MOTOR DRIVE SYSTEM

Motor Control Box

- **Rugged construction**
- **Precision ground shaft**
- **Variable speed control**
- **All metal motor drive**
- **No lost counts of travel**
- **No jitter counting**
- **Quadrature X1 counting mode**
- **Two sizes of water tanks are available**
- **Meets AAPM-51 and IAEA TRS-398 dosimetry protocol requirements**

Motor Drive System
The main feature of this motor drive system is that no travel movement counts are lost if jogging up or down when setting the chamber depth position. This is due to an output shaft encoder producing 100 counts per millimeter in travel and a quadrature X 1 counting mode. This mode requires two identical square wave signals with one of the (QUAD) shifted 90° relative to other (COUNT). These two signals are processed by a dual counter. Counter accuracy becomes 0.01 mm with no lost counts.

The all metal motor drive system adds convenience and saves time by allowing the user to set the ion chamber position from outside of the treatment room.

The motor control box has a 5 digit 1/2" (1.27 cm) LCD (liquid crystal display) which reads to 0.01 mm resolution, and has a reset button below the display. A downward chamber movement is indicated by a (-) on the LCD. A knob for the motor speed control sets the speed of travel based on the % of maximum motor speed. When pushed, the drive thumb switch gives continuous motion in the up (p / +) or down (q / -) direction of travel. A lighted power switch indicates when the unit is on. The motor control box is fused through a 6' (1.8 m) long hospital grade cord that attaches to the motor control box through an isolation transformer. A fuse holder is located on the back of the motor control box for easy service and accessibility.

A 50' (15.25 m) fully shielded cable connects the motor control box to the motor drive unit. Individual cables (Item 691-080) can be installed in each treatment room.

The motor drive unit sits on the side of the water phantom and is manually positioned in the X or Y axis using the scales on the side of the phantom. The motor drive unit is held in place using the two tightening screws. The momentary toggle switch on the side of the motor drive unit also controls the up/down direction of travel. The speed of travel is set at the motor control box. The vertical position is displayed in millimeters at the motor control box or can be read on the 30 cm scale attached to the motor drive unit. The maximum vertical travel is 30 cm.

For safety the maximum power supply to the motor is 24 volts D.C. All components of the motor control box and motor drive unit are UL approved.

Water Phantom
The water phantom has 1/4" (0.635 cm) thick clear acrylic sides, a 3/8" (0.953 cm) thick white acrylic bottom, and a clear acrylic support rim at the top of the phantom. The white bottom allows for easy viewing of the chamber and cross hair shadows. The water phantom has a tank plug and a drain valve assembly. A 5' (1.5 m) drain hose is also included. Two sides of the water phantom have ±16 cm scales with millimeter markings. The water phantom is available in two sizes: large and small.

A 46 cm aluminum depth scale with millimeter markings is included with the water phantom. The depth scale has a half-round cutout at the base which allows positioning on the active area of a RPD waterproofing tip (Item 691-030 and 691-032) for a Farmer style chamber. When using the 46 cm aluminum depth scale on the active chamber area of a **waterproof** Farmer style chamber (all manufacturers) to measure water depth, **subtract 1 mm** from depth reading.

Items 691-010 Small Water Phantom and 691-015 Large Water Phantom Includes

- Motor control box
- 50' (15.25 m) cable
- Motor drive unit
- 46 cm aluminum depth scale (Item 692-000-50)
- Chamber support rod w/scribing, 1/2" (1.27 cm) diameter delrin (Item 691-036 or Item 691-037)
- Acrylic holder for a Farmer Style Chamber (Item 691-034)
- Drain valve assembly (Item 691-000-56)
- Pipe plug (Item 14-310)
- 5' (1.5 m) drain hose with hose connection (Item 691-090)

Specifications

Motor Drive System
Power: 115 Vac, 50/60 Hz
Optional Power: 230 Vac, 50/60 Hz
Display: 5 Digit LCD
Accuracy: 0.01 mm
Travel: 30 cm
Cable: 50' (15.25 m) Fully shielded
Motor: Variable speed, reversible, 24 VDC

Item 691-010 Small Water Phantom
Inside Dimensions: 35 cm x 40 cm x 38 cm D
Gallons: 13
Weight: 15 lb (6.8 kg)
Weight When Full: Approximately 104 lb (47.3 kg)

Item 691-015 Large Water Phantom
Inside Dimensions: 40 cm x 45 cm x 38 cm D
Gallons: 16.5
Weight: 16.5 lb (7.5 kg)
Weight When Full: Approximately 132 lb (60 kg)

Item	Description
691-010	Small Water Phantom with Motor Drive System
691-015	Large Water Phantom with Motor Drive System
691-080	Cable, Fully Shielded, 50' (15.25 m)
692-000-50	46 cm Depth Scale

WATER PHANTOM MANUAL DRIVE SYSTEM

- **Rugged construction**
- **Precision ground shaft**
- **Quadrature X1 counting mode**
- **Two sizes of water tanks are available**
- **Meets AAPM-51 and IAEA TRS-398 dosimetry protocol requirements**

Manual Drive Unit
When using the manual drive unit the chamber is manually positioned in the X or Y axis using the scale on the side of the water phantom. The manual drive unit is held in place by two tightening screws. The chamber is adjusted on the Z axis using the manual drive. The maximum vertical travel is 30 cm. A precision 2:1 gear box allows for quick vertical motion. The large handwheel provides ease of motion and a 0.1 mm mechanical increment counter provides an accurate readout of the vertical position of the chamber. One turn of the handwheel is equal to 3.0 mm of travel. The mechanical counter can be reset to zero at any position by turning the reset knob (located on the side of the counter) counter clockwise.

Water Phantom
The water phantom has 1/4" (0.635 cm) thick clear acrylic sides, a 3/8" (0.953 cm) thick white acrylic bottom, and a clear acrylic support rim at the top of the phantom. The white bottom allows for easy viewing of the chamber and cross hair shadows. The water phantom has a tank plug and a drain valve assembly. A 5' (1.5 m) drain hose is also included. Two sides of the water phantom have ±16 cm scales with millimeter markings. The water phantom is available in two sizes: large and small.

A 46 cm aluminum depth scale with millimeter markings is included with the water phantom. The depth scale has a half-round cutout at the base which allows positioning on the active area of a RPD waterproofing tip (Item 691-030 and 691-032) for a Farmer style chamber. When using the 46 cm aluminum depth scale on the active chamber area of a **waterproof** Farmer style chamber (all manufacturers) to measure water depth, **subtract 1 mm** from depth reading.

Items 691-001 Small Water Phantom and 691-005 Large Water Phantom Includes

- 46 cm aluminum depth scale (Item 692-000-50)
- Chamber support rod w/scribing, 1/2" (1.27 cm) diameter delrin (Item 691-036 or Item 691-037)
- Acrylic holder for a Farmer Style Chamber (Item 691-034)
- Drain valve assembly (Item 691-000-56)
- Pipe plug (Item 14-310)
- 5' (1.5 m) drain hose with hose connection (Item 691-090)

Specifications

Manual Drive Unit
Counter: Mechanical
Accuracy: 0.1 mm
Travel: 30 cm

Item 691-001 Small Water Phantom
Inside Dimensions: 35 cm x 40 cm x 38 cm D
Gallons: 13
Weight: 15 lb (6.8 kg)
Weight When Full: Approximately 104 lb (47.3 kg)

Item 691-005 Large Water Phantom
Inside Dimensions: 40 cm x 45 cm x 38 cm D
Gallons: 16.5
Weight: 16.5 lb (7.5 kg)
Weight When Full: Approximately 132 lb (60 kg)

Item	Description
691-001	Small Water Phantom with Manual Drive Unit
691-005	Large Water Phantom with Manual Drive Unit

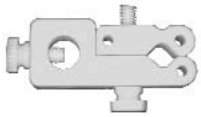
CHAMBER HOLDERS FOR WATER PHANTOM

691-034 and 691-036 or 691-037 are included with water tank

691-034

691-040

691-041, 691-042 or 691-043



691-050

The Markus (Item 691-041) or Roos (Item 691-042) chamber holders will hold the chamber parallel with the water surface. A thumb screw secures the chamber in place.

Item #	Description
691-034	Farmer Style Chamber Holder - Additional/Replacement
691-036	Chamber Support Rod for Small Water Phantom
691-037	Chamber Support Rod for Large Water Phantom
691-040	Chamber Holder for PTW 0.1cc, 0.125cc, and 0.3cc Chambers
691-041	PTW Markus/Exradin A10/Wellhoffer NACP Chamber Holder - Acrylic
691-042	PTW Roos/Wellhoffer PPC40/PPC 035 Chamber Holder - Acrylic
691-043	Exradin Model 11 Chamber Holder - Acrylic
691-050	Universal Chamber Holder - Sizes 5.8mm to 17.7mm Dia.

R

CHAMBER WATERPROOFING ACCESSORIES

691-030

691-030 Shown with a Farmer Style Chamber Holder

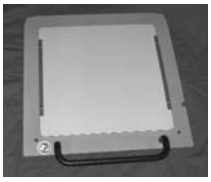
A Farmer Style Chamber can be housed in a watertight tip made of polystyrene (Item 693-030) or acrylic (Item 693-032) with a chamber tip wall thickness of 1 mm. The chamber has a 60 cm rubber tube extending out of the phantom. Atmospheric air pressure is provided through the rubber tube to the chamber tip.

Item	Description
691-030	Waterproof Poly Farmer Style Chamber Tip with Tubing
691-032	Waterproof Acrylic Farmer Style Chamber Tip with Tubing

Will NOT Fit Exradin A12 Chamber

LEAD FOIL OR LEAD FOIL TRAY FOR TG-51

691-175



691-176

691-177

691-184

Lead Thickness: ± 10% of 1 mm

Item #	Description
691-175	1 mm Thick x 25 cm Sq. Lead Foil
691-176	1 mm Pb Foil on Varian Type III Tray - Wedge Slot
691-177	1 mm Pb Foil on Varian Type III Tray - Block Slot
691-178	1 mm Pb Foil on Varian Type II Tray - Wedge Slot
691-180	1 mm Pb Foil on Siemens Screw Coded Tray - Block Slot
691-184	1 mm Pb Foil on Siemens Tray w/ Code By-pass - Block Slot
691-185	1 mm Pb Foil on Siemens Tray w/ Code Plug* - Block Slot
691-190	1 mm Pb Foil on Philips/ Elekta Acrylic Tray - Block Slot

* Coding Plug is extra, use Item 1884-10-5

CASE & TRANSPORT CART FOR WATER PHANTOM

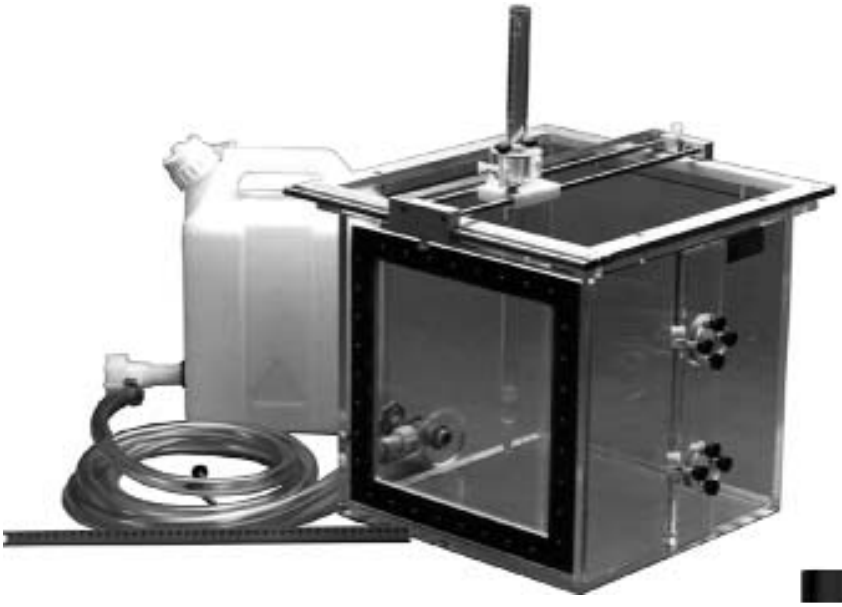
691-055

691-056

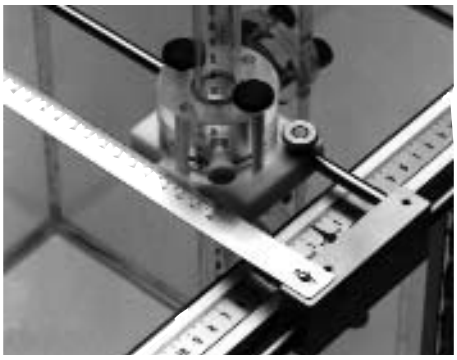
An optional foam lined storage case (Item 691-055) for the motor drive provides safe transport/storage. Also available is a collapsible transport cart (Item 691-056) with bungee straps that will hold the storage case, water phantom and accessories to provide easy transport.

Item #	Optional Waterproofing Accessories
691-055	Case for Motor Drive and Control
691-056	Foldable Transport Cart

MYLAR WINDOW WATER PHANTOM



692-000-60



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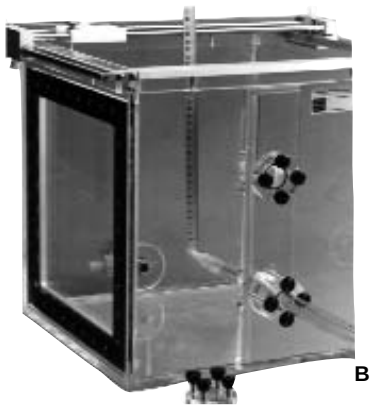


B

Mylar Window
The window is made of 0.010" thick Mylar. It is mounted in an 27 cm square aluminum frame. The outside of the water phantom is 18.7 cm from the bottom to the center of the mylar window.

Two Water-Tight Side Openings
The side openings for the chamber holder are located 10 cm and 25 cm from the bottom of the phantom. The chamber holder has a single axis of motion.

Drain
The Water Phantom drain valve can be connected with a vinyl hose to a 2 1/2" gallon reservoir tank with valve. Place the reservoir tank above the water phantom and open the valves to raise the water level. Place the reservoir tank below the water phantom to lower the water level.

Depth Scale
A 46 cm aluminum depth scale with millimeter markings is included with the water phantom. The depth scale has a half-round cutout at the base which allows positioning on the active area of a RPD waterproofing tip (Item 691-030 and 691-032) for a Farmer style chamber.

When using the 46 cm aluminum depth scale on the active chamber area of a **waterproof** Farmer style chamber (all manufacturers) to measure water depth, **subtract 1 mm** from depth reading.

Chamber Holder
The chamber holder comes with an 18" L x 7/8" or 5/8" diameter acrylic tube with a polystyrene or acrylic tip that has a 1 mm thick wall for a Farmer Style Chambers (Figure B). A millimeter scale is silk screened on the outside of the 7/8" diameter tube only. Optional chamber holders are also available.

Chamber Carriage
A welded aluminum frame is secured to the phantom. It can be rotated 90º. X-axis delrin bearings slide on a stainless steel rod with two scales and locks. A Y-axis delrin chamber holder slides on stainless steel rods with a lock and is adjustable (Figure A). An adjustable scale allows for accurate setting of the chamber tip to the mylar window distance. A Z-axis acrylic chamber holder slides on o-rings with a lock.

Service
Lubricate o-rings with vaseline so the acrylic chamber tube slides easily.

Specifications

Size: 35 cm x 37 cm H
Weight (empty): 42 lbs
Weight with Water: 94 lbs. (35 cm³)
Material: Acrylic reinforced top and corners (sides measure 1/4" thick and bottom measures 3/8" thick)
Shipping Weight: 42 lbs.

Included with Mylar Window Water Phantom:
Hose w/drain connection
2 1/2 gallon reservoir tank
46 cm depth scale
3 cm calibrator from Farmer Chamber tube
1 chamber holder of your choice

Item #	Description
692-000	Mylar Window Water Phantom
	Replacement Accessories
692-000-50	46 cm Depth Scale
692-000-60	Farmer Chamber Tube 3 cm Calibrator
692-011	Hose with Drain Connection

CHAMBER HOLDERS FOR MYLAR WINDOW PHANTOM

- **Waterproof**
- **Included o-ring assembly**
- **Scaled acrylic tube**

The chamber holders are watertight acrylic tubes that have a 1 mm thick polystyrene or acrylic tip for Farmer-style Ion Chambers. A 50 cm scale is printed on the tube. No further waterproofing is necessary.

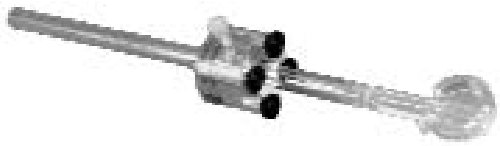
Item 692-600 and 692-610 Options A and B
Fit Capintec PR-06C or G with TNC connector.

Item 692-620 and 692-630 Options C and D
Fit all Farmer-style chambers except Capintec PR-06C or G with TNC connector.

Item #	Chamber Holder	Tube Diameter	Tip Material
692-600	Option A	0.875" (2.22 cm)	Polystyrene
692-610	Option B	0.875" (2.22 cm)	Acrylic
692-620	Option C	0.625" (1.59 cm)	Polystyrene
692-630	Option D	0.625" (1.59 cm)	Acrylic
692-635	Exradin A12	0.875" (2.22 cm)	Polystyrene

R

OPTION "N" COMBINATION CHAMBER HOLDER



The Option "N" Chamber Holder has a 5/8" O.D. tube and is a combination holder. It can be used for the Markus chamber, and the 0.3 cm^3 or 0.1 cm^3 chambers. This holder can be used both horizontally or vertically.

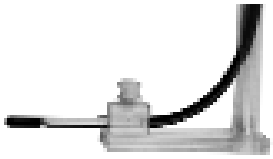
Item #	Description
692-652	Option "N"Combination Chamber Holder

OPTION "H" CHAMBER HOLDER

The Option "H" Chamber Holder is a 5/8 O.D. acrylic tube used with the PTW 23332/233641/31003/31013 waterproof chamber.

Item #	Description
692-640	Option "H" Chamber Holder

OPTION "L" CHAMBER HOLDER



The Option "L" Chamber Holder has a 5/8" O.D. acrylic tube and holds a PTW 23332/233641/31003/31013 chamber parallel to the water surface.

Item #	Description
692-641	Option "L" Chamber Holder

OPTION "M", "O", & "Q" HOLDERS

The Option "M", "O", and "Q" Chamber Holders have a 7/8" O.D. Tube and are used to hold a Markus (PTW 23343), Roos (PTW 34001) or Exradin Model 11 Chamber parallel to the water surface.

Item #	Description
692-651	Option "M" Chamber Holder
692-653	Option "O" Roos Chamber Holder
692-655	Option "Q" Exradin Model 11 Chamber Holder

OPTION "K", "P", "R" & "S" HOLDERS

The Option "K", "P", "R" and "S" Chamber Holders are used to hold a Markus (PTW 23343), Roos (PTW 34001), Exradin Model 11 or Exradin Model 10 Chamber parallel to the mylar window.

Item #	Description
692-650	Option "K" Markus Chamber Holder
692-654	Option "P" Roos Chamber Holder
692-656	Option "R" Exradin Model 11 Chamber Holder
692-658	Option "S" Exradin Model A10 Chamber Holder

HYDRAULIC-SCISSORS LIFT TABLE

The Hydraulic-Scissors Lift Table is ideally suited to hold a water phantom. A white platform top allows for easy viewing of the crosshairs through a water phantom with a clear bottom.

The lift table has three holes drilled in the platform to accommodate the corresponding leveling plate (see below).

The Hydraulic-Scissors Lift Table utilizes a jack pedal to raise the platform. A mechanical height lock will hold the platform at the desired height. To lower the platform use the lowering lever.

Use the parking brake to hold the hydraulic-scissors lift table in place. Four heavy duty leveling legs are used to make sure the platform is level when being used. For more precise leveling, use the leveling plate which is compatible with lift table. The hydraulic-scissors lift table is easily moved by the four 5" diameter casters. Item 693-037 accommodates a large Wellhofer water tank.

Specifications

Platform Height Adjustment: 11.8" to 36.6"
Handle Height: 37.8",
Front Casters: 5" diameter rigid rubber
Rear Casters: 5" diameter, swivel rigid rubber
Capacity: 1,100 lbs.
Finish: White platform - blue enamel frame
Shipping Weight: 265 lbs. - 300 lbs.

Item #	Description
693-036	Hydraulic-Scissors Lift Table Table Top Size: 23 3/4" x 36"
693-037	Hydraulic-Scissors Lift Table Table Top Size: 27 3/4" x 36"

LEVELING PLATE

For Hydraulic-Scissors Lift Table

The aluminum leveling plate utilizes three point leveling. Three location pads fit into the pre-drilled holes on the platform of the hydraulic-scissors lift table. The three hand adjustable threaded leveling legs go through the holes in the leveling plate and rest inside the location pads.

For added stabilization a pair of rubber feet are included. These feet will go through the tapped holes on either side of the third leg of the leveling plate.

Specifications

Height Adjustment: 1/2" to 3 3/4"
Plate Size: 35 7/8" L x 1/2" T
Finish: White polyurethane enamel
Weight: 39 lbs. - 50 lbs.

Item #	Description
693-3624	Leveling Plate - 24" Wide For Use With Item 693-036
693-3627	Leveling Plate - 27" Wide For Use With Item 693-037

LEVELING PLATE

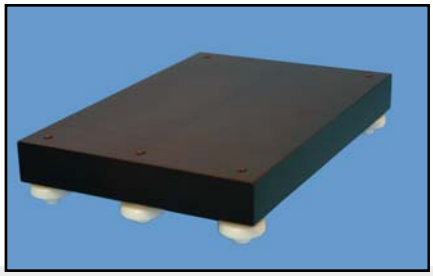
For Water Phantom Tank

The three point Leveling Plate is used with the Water Phantoms (Item 692-000 or 691-000). The aluminum plate is 18" x 24"x 1/2". A wood support panel on the bottom is 3/4" thick.

Item #	Description
693-080	Leveling Plate with Support Board with 3 Leveling Legs

LEVELING PLATE

For Slab Phantoms



The leveling plate for slab phantoms has five leveling legs, is made from ABS Plastic, and has threaded nylon knobs.

Specifications:

Capacity: 60 lbs
Dimensions: 30 cm x 44 cm x 2 cm thick

Item #	Description
657-400	Leveling Plate with 5 Leveling Legs

LEVELING PLATE

For Water Phantoms on Treatment Table

The three hand adjustable threaded leveling legs go through the holes in the leveling plate and secured to anti-skid feet.

For added stabilization a pair of rubber feet are included. These feet will go through the tapped holes on either side of the third leg of the leveling plate.

Material: Aluminum
Finish: White polyurethane enamel
Feet: Anti-skid

Item #	Description
693-083	Leveling Plate with 3 Anti-Skid Feet Size: 18” W x 24” L x 1/2” T
693-085	Leveling Plate with 3 Anti-Skid Feet Size: 24” W x 35 7/8” x 1/2” T

R

WATER TRANSFER TANK AND PUMP

The 60 gallon Water Transfer Tank is molded of polyethylene in one piece to eliminate seams and stress areas. The 1/4" (0.64 cm) wall thickness will bow slightly when filled with water. The water level will show through the tank wall. A mark can be made on the outside of the tank for the fill capacity of your Water Phantom. A steel frame supports the transfer tank with four 5" (12.7 cm) diameter swivel casters to allow easy movement.

The removable top is made of 1/2" thick (1.27 cm) polyethylene with two holes. A copper pipe inserted through the stand-off hole touches the bottom of tank. This pipe is attached to one end of a 45 gallon/8 minute pump and the other end is attached to 10' (3 m) of clear vinyl tubing. The tubing is put into the Water Transfer Tank from the top for filling. To pump the water from the water phantom back into the Water Transfer Tank, simply reverse the water connections on the pump. A faucet adapter is included for initial filling of the transfer tank, using the vinyl tubing.

Specifications

Item 695-000 Water Transfer Tank with Pump
Tank Dimension: 24" x 24" x 24" (61 x 61 x 61 cm)
Overall Dimension: 26" x 26" x 43" (66 x 66 x 109 cm)
Pump: 115V VAC, 1.6 Amps, thermal protection
Shipping Weight: 83 lb (38 kg)

Item 695-020 Pump Repair Kit
Includes: Impeller and cover gasket

Item #	Description
695-000	Water Transfer Tank with Pump
695-010	Water Transfer Tank Only, NO PUMP
695-015	Pump, HI/LOW Temp, 115 VAC
695-020	Impeller Repair Kit for 695-015 Pump

15-GALLON WATER TANK WITH HAND PUMP OR MOTORIZED PUMP

695-100

695-200

- **Easy to Use**
- **Lightweight**
- **Mobile**

The Water Tank is a 15 gallon drum constructed of one piece of low density polyethylene. It has a removable slide lever lock lid and two bung openings. For mobility the water tank sits on a polyethylene dollie with four swivel casters.

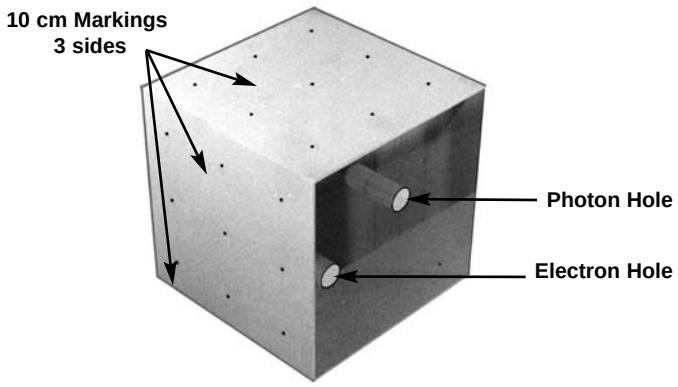
Item 695-100 Water Tank w/ Hand Pump
The Hand Pump is a reversible crank style and will pump 6 gallons of water with 50 revolutions. Turning the crank clockwise will pump water into a water phantom and turning counter clockwise will pump water out of the water phantom. A 5 foot hose is attached to the pump.

Item 695-200 Water Tank w/ Motorized Pump
The electric pump is 115V VAC, 1.6 Amps, with thermal protection. The pump the water from the water phantom back into the tank, simply reverse the water connections on the pump.

Specifications:
Drum Size: 16” Dia. X 22 3/4” H
Dollie Size: 17” Dia. X 7” H (includes casters)
Shipping Weight: Approximately 20 lbs.

Item #	Description
695-100	Water Tank with Reversible Hand Pump- 15 Gallon
695-200	Water Tank with Motorized Pump- 15 Gallon
695-020	Pump Repair Kit

15 CM CUBE CONSTANCY PHANTOMS



- **Photon measurements at 5 and 10 cm depth**
- **Electron measurements at 1 cm or 1.5 cm depth**
- **Compact and economical**

The constancy phantoms are solid 15 cm cubes. The photon hole is placed 5 cm from one side and therefore is 10 cm from the other side. Three sides of the cube contain 9 black dots which define a 10 cm² field

The phantom cubes can be custom drilled to meet customers specifications. Please provide name and phone number of contact person.

Specifications

Acrylic Density: 1.185g/cm³
Plastic Water Density: 1.02g/cm³

R

PLASTIC WATER PHANTOMS

Item #	Chamber	Compatible Chamber Model #'s	Photon Chamber Hole	Electron Chamber Hole
665-510	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE2505/3	With Build-up Cap	1.0 cm Depth, No Build-up Cap
665-512	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE2505/3	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-513	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE2505/3	No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-514	0.6 cc Farmer Style Chamber	**ALL** - PTW / Nuclear Associates / Bicron NE / Capintec / RMI / Exradin A19	No Build-up Cap	1.0 cm Depth, No Build-up Cap
665-518	Exradin A12		No Build-up Cap	1.5 cm Depth, No Build-up Cap

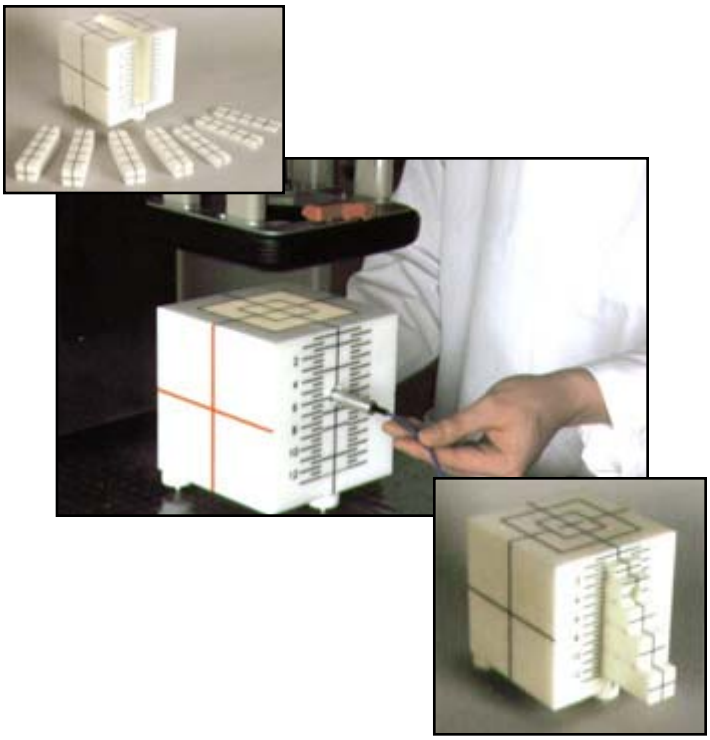
ACRYLIC PHANTOMS

Item #	Chamber	Compatible Chamber Model #'s	Photon Chamber Hole	Electron Chamber Hole
665-601	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE2505/3	With Build-up Cap	1.0 cm Depth, No Build-up Cap
665-602	0.3 cc Waterproof Chamber	PTW 23332 / 233641 / 31003 / 31013, Nuclear Associates 30-316, 30-317	No Build-up Cap	1.0 cm Depth, No Build-up Cap
665-6025	0.3 cc Waterproof Chamber	PTW 23332 / 233641 / 31003 / 31013, Nuclear Associates 30-316, 30-317	No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-603	0.6 cc Farmer Style Chamber	NE2581	With Build-up Cap	1.5 cm Depth, No Build-up Cap
665-605	0.125 cc Chamber	PTW 233642 / 31002 / 31010, Nuclear Associates 30-344	No Build-up Cap	1.0 cm Depth, No Build-up Cap
665-622	0.6 cc Farmer Style Chamber	Capintec PR-06C, PR-06G	With Build-up Cap	1.5 cm Depth, No Build-up Cap
665-642	0.1 cc Chamber	PTW N23323 and Nuclear Associates 30-350	No Build-up Cap	1.0 cm Depth, No Build-up Cap
665-702	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE 2505/3, Nuclear Associates 30-351, 30-352	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-704	0.6 cc Farmer Style Chamber	PTW 0.6cc Farmer Chambers, NE 2505/3, Nuclear Associates 30-351, 30-352	With Build-up Cap	1.5 cm Depth, No Build-up Cap
665-705	0.125 cc Chamber 0.50" Dia.	PTW: 233642 / 31002 / 31010, Nuclear Associates 30-344	No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-712	0.6 cc Farmer Style Chamber	NE2571	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-722	0.6 cc Farmer Style Chamber	Capintec PR-06C and PR-06G	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-732	0.6 cc Farmer Style Chamber	NE 2581	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-750	Exradin Model A-12		No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-751	Exradin Model A-12		With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-752	Exradin Model A1SL		No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-753	Exradin Model A-16		No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-760	0.6 cc Farmer Style Chamber	**ALL** - PTW / Nuclear Associates / FLUKE / Bicron NE / Capintec / RMI / Exradin A19 Farmer Style Chambers	No Build-up Cap	1.5 cm Depth, No Build-up Cap
665-761	0.6 cc Farmer Style Chamber	**ALL** - PTW / Nuclear Associates / Bicron NE / Capintec / RMI / Exradin A19	No Build-up Cap	1.0 cm Depth, No Build-up Cap
665-770	0.6 cc Farmer Style Chamber	Exradin A19	With Build-up Cap	1.0 cm Depth, No Build-up Cap
665-771	0.6 cc Farmer Style Chamber	Exradin A19	With Build-up Cap	1.5 cm Depth, With Build-up Cap
665-780	Scanditronix / Wellhofer FC65-G		No Build-up Cap	1.5 cm Depth, No Build-up Cap

PLUG INSERT

Item #	Chamber	Compatible Chamber Model #'s	Photon Chamber Hole	Electron Chamber Hole
665-6011	0.6 cc Farmer Style Chamber	Acrylic Plug Insert for PTW N23333	With Build-up Cap	

REINSTEIN EZ-CUBE PHANTOM



- **Output constancy measurements for photon and electron beams**
- **Depth dose constancy measurements for photon and electron beams**
- **Superior phantom alignment stability and Ion chamber positioning reproducibility**
- **Rapid, precise and reproducible Ion chamber depth changes (from 1cm to 12cm depth at 0.5cm intervals) while maintaining constant TSD**
- **Easily readable and unambiguous Ion chamber depth scale**
- **Output plus depth dose constancy measurements at 90°, 180°, 270° gantry angles**
- **One phantom setup for all output and energy constancy measurement depths**
- **Reduction of total setup and measuring times by as much as 75%**
- **Includes adjustable support leveling legs and a bubble level**

The Reinstein EZ-Cube Phantom delivers fast, easy and accurate output depth dose constancy measurements for photon and electron beams in accordance with AARPM TG-40 guidelines. The cube phantom provides quick and accurately changing ion chamber depth without the need for realignment between measurements.

The Reinstein EZ-Cube Phantom is a radiation oncology QA phantom that provides rapid and reproducible Ion chamber positioning from 1cm to 12cm depth at 0.5cm intervals. Its unique design allows placement of the Ion chamber through a range of depths, without ever having to readjust the phantom position with respect to the central axis or its TSD. Conventional solid "slab" phantoms often require realignment of the slabs for each change in Ion chamber depth. This can waste substantial amounts of time and lead to misalignment, especially during monthly QA (as recommended by AAPM TG-40) of a dual-photon, multiple-electron beam accelerator.

The Reinstein EZ-Cube phantom is designed to simplify testing of beam output plus energy constancy at three gantry angles: 90°, 180°, 270°, as described in "Comprehensive QA for Radiation Oncology: Report of AAPM Radiation Therapy Committee Task Group 40."

Advantages

- Simplifies testing of output versus gantry angel, which is difficult to accomplish by other phantoms.
- Provides rapid and reproducible Ion chamber positioning at 0.5 cm steps, without the need for repeated readjustment of phantom position.
- Eliminates the need to periodically recalibrate or balance detectors - a significant hidden expense with multiple detector systems.
- Is a multipurpose, cost-saving QA and calibration phantom that makes use of your own ion chamber and electrometer.
- Verifies every constancy measurement for photon and electron beams.

Item 682-450 Reinstein EZ - Cube Phantom Includes

(1) EZ - Cube Phantom with the following positioning inserts:
- (2) 3.0 cm thick
- (1) 2.5 cm thick
- (1) 2.0 cm thick
- (2) 1.0 cm thick
- (1) 0.5 cm thick

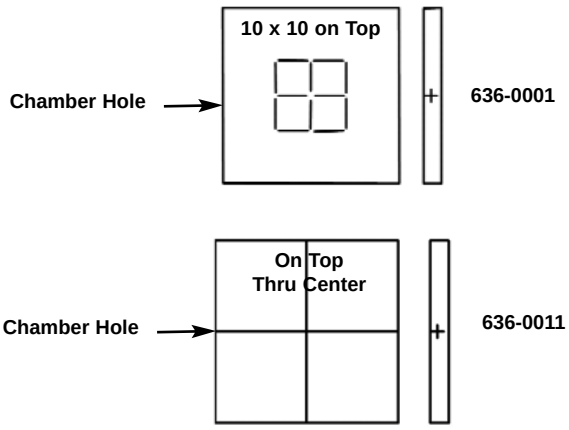
NOTE: Customer must supply a detailed schematic as to the probe they will be using with build-up caps.

Specifications

Material: UHMW
Overall Weight: 8 lb (3.7 kg)
Size: 6" x 6" x 6" (15 x 15 x 15cm)
Adjustable: Leveling feet and Bubble Level

Item #	Description
682-450	Reinstein EZ-Cube Phantom

SCRIBING ON CHAMBER PHANTOMS



1 side: + scribe is opposite chamber hole.
2 sides: + scribes are on sides perpendicular to the chamber.
3 sides: + scribes are on the sides without chamber hole.
4 sides: + scribes are on all four sides.

Item #	Scribing
636-0000	10 x 10 cm on Top
636-0001	10 cm x 10 cm on Top, + 1 Side
636-0002	10 cm x 10 cm on Top, + 2 Sides
636-0003	10 cm x 10 cm on Top, + 3 Sides
636-0004	10 cm x 10 cm on Top, + 4 Sides
636-0005	10 cm x 10 cm on Top and Bottom
636-0006	10 cm x 10 cm on Top and Bottom + 1 Side
636-0007	10 cm x 10 cm on Top and Bottom + 2 Sides
636-0008	10 cm x 10 cm on Top and Bottom + 3 Sides
636-0009	10 cm x 10 cm on Top and Bottom + 4 Sides
636-0010	Top Thru Center
636-0011	Top Thru Center, + 1 Side
636-0012	Top Thru Center, + 2 Sides
636-0013	Top Thru Center, + 3 Sides
636-0014	Top Thru Center, + 4 Sides

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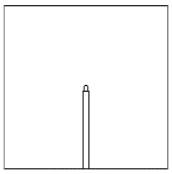
PHANTOMS FOR SCANDITRONIX / WELLHOFFER IONIZATION CHAMBERS

SCANDATRONIX/WELLHOFFER IC 15, CC13

0.13 cm³ Chamber without Build-Up Cap

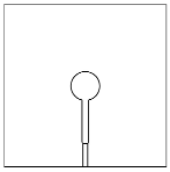


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-736	Polystyrene	25 cm sq. x 2.5 cm T
636-737	Acrylic	25 cm sq. x 2.5 cm T
636-738	Plastic Water	30 cm sq. x 2 cm T
636-739	Solid Water	30 cm sq. x 2 cm T

WELLHOFFER PPC 035 AND PPC40

0.05 cm³ Chamber



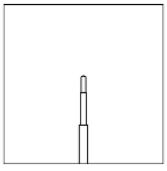
Chamber is flush with surface.

Item #	Phantom Material	Size
636-731	Polystyrene	25 cm sq. x 2.5 cm T
636-732	Acrylic	25 cm sq. x 2.5 cm T
636-733	Plastic Water	30 cm sq. x 2 cm T
636-734	Solid Water	30 cm sq. x 2 cm T

PHANTOMS FOR PTW IONIZATION CHAMBERS

PTW 23333, 30001, 30002, 30004, 30006, 30010, 30011, 30012, 30013

0.6 cm³ Farmer Style Chamber without Build-Up Cap



Most Common

Chamber Hole Depth:
1 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

PHANTOMS FOR PTW IONIZATION CHAMBERS

PTW 23333, 30001, 30002, 30004, 30006, 30010, 30011, 30012, 30013

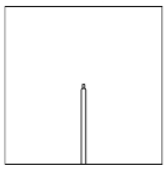
0.6 cm³ Farmer Style Chamber with Build-Up Cap

Chamber Hole Depth:
1.2 cm from top to center of hole, and has a diameter of 1.65 cm.

Item #	Phantom Material	Size
636-101	Polystyrene	25 cm sq. x 2.5 cm T
636-102	Acrylic	25 cm sq. x 2.5 cm T
636-103	Solid Water	30 cm sq. x 3 cm T
636-104	Plastic Water	30 cm sq. x 3 cm T

PTW 31006, 31014, 31015, 31016

0.015 cm³ Pin Point Chamber without Build-Up Cap

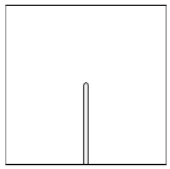


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-526	Polystyrene	25 cm sq. x 2.5 cm T
636-527	Acrylic	25 cm sq. x 2.5 cm T
636-528	Plastic Water	30 cm sq. x 2 cm T
636-529	Solid Water	30 cm sq. x 2 cm T

PTW 233642, 31002, 31010, 233643, 31005, 31011

0.125 cm³ Chamber without Build-Up Cap

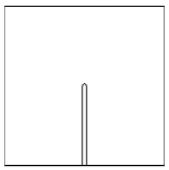


Chamber Hole Depth:
1 cm from top to center of hole.

Item #	Phantom Material	Size
636-511	Polystyrene	25 cm sq. x 2.5 cm T
636-512	Acrylic	25 cm sq. x 2.5 cm T
636-514	Plastic Water	30 cm sq. x 2 cm T
636-514-2	Plastic Water Chamber Plug	
636-515	Solid Water	30 cm sq. x 2 cm T

PTW 23332, 233641, 31003, 31013

0.3 cm³ Chamber without Build-Up Cap



Chamber Hole Depth:
0.7 cm from top to center of hole.

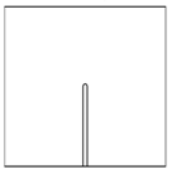
Item #	Phantom Material	Size
636-301	Polystyrene	25 cm sq. x 2.5 cm T
636-302	Acrylic	25 cm sq. x 2.5 cm T

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-311	Polystyrene	25 cm sq. x 2.5 cm T
636-312	Acrylic	25 cm sq. x 2.5 cm T
636-313	Plastic Water	30 cm sq. x 2 cm T
636-313-2	Plastic Water Chamber Plug	
636-314	Solid Water	30 cm sq. x 2 cm T
636-314-2	Solid Water Chamber Plug	

PTW 23323, 2332

0.1 cm³ Chamber without Build-Up Cap



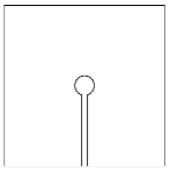
Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-501	Polystyrene	25 cm sq. x 2.5 cm T
636-502	Acrylic	25 cm sq. x 2.5 cm T
636-503	Plastic Water	30 cm sq. x 2 cm T
636-503-2	Plastic Water Chamber Plug	
636-504	Solid Water	30 cm sq. x 2 cm T
636-504-2	Solid Water Chamber Plug	

PHANTOMS FOR PTW IONIZATION CHAMBERS

PTW 23343, 34045

0.055 cm³ Markus and 0.02 cm³ Advanced Markus Chamber

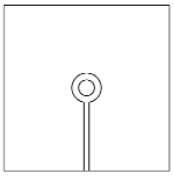


Chamber is flush with surface.

Item #	Phantom Material	Size
636-701	Polystyrene with Cable Cover	25 cm sq. x 2.5 cm T
636-702	Acrylic with Cable Cover	25 cm sq. x 2.5 cm T
636-704	Plastic Water	30 cm sq. x 2 cm T
636-704-2	Plastic Water Cable Cover	
636-706	Solid Water	30 cm sq. x 2 cm T
636-706-2	Solid Water Cable Cover	

PTW 34001

0.35 cm³ Roos Chamber



Chamber is flush with surface.

Item #	Phantom Material	Size
636-721	Polystyrene	25 cm sq. x 2.5 cm T
636-722	Acrylic	25 cm sq. x 2.5 cm T
636-723	Plastic Water	30 cm sq. x 2 cm T
636-724	Solid Water	30 cm sq. x 2 cm T

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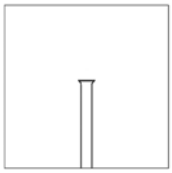
PTW 23342

0.02 cm³ Small Soft X-ray Chamber



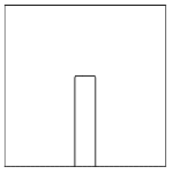
The chamber hole has special curved sides.

Chamber is flush with surface.

Item #	Phantom Material	Size
636-915	Polystyrene	25 cm sq. x 2.5 cm T
636-915-2	Polystyrene Chamber Plug	
636-916	Acrylic	25 cm sq. x 2.5 cm T
636-916-2	Acrylic Chamber Plug	
636-917	Plastic Water	25 cm sq. x 2 cm T
636-918	Solid Water	30 cm sq. x 2 cm T

PTW 23344

.02 cm³ Big Soft X-ray Chamber

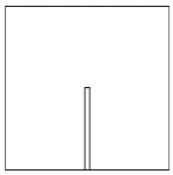


Chamber is flush with surface.

Item #	Phantom Material	Size
636-911	Polystyrene	25 cm sq. x 2.5 cm T
636-912	Acrylic	25 cm sq. x 2.5 cm T
636-913	Plastic Water	25 cm sq. x 2 cm T
636-914	Solid Water	30 cm sq. x 2 cm T

PTW T60003

Riga Diamond Detector Chamber without Build-Up Cap

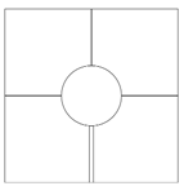


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-521	Polystyrene	25 cm sq. x 2.5 cm T
636-522	Acrylic	25 cm sq. x 2.5 cm T
636-523	Plastic Water	30 cm sq. x 2 cm T
636-524	Solid Water	30 cm sq. x 2 cm T

PTW 34070

Bragg Peak Chamber



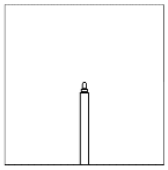
Chamber is flush with surface.

Item #	Phantom Material	Size
636-752	Acrylic	30 cm sq. x 2 cm T

PHANTOMS FOR EXRADIN IONIZATION CHAMBERS

EXRADIN MODEL A1

0.056 cm³ Chamber without Build-Up Cap

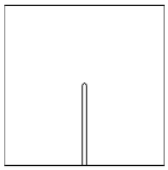


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-211	Polystyrene	25 cm sq. x 2.5 cm T
636-212	Acrylic	25 cm sq. x 2.5 cm T
636-213	Plastic Water	30 cm sq. x 2 cm T
636-214	Solid Water	30 cm sq. x 2 cm T

EXRADIN MODEL A1SL

0.056 cm³ Chamber without Build-Up Cap

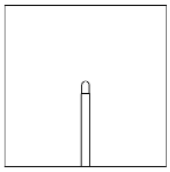


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-206	Polystyrene	25 cm sq. x 2.5 cm T
636-207	Acrylic	25 cm sq. x 2.5 cm T
636-208	Plastic Water	30 cm sq. x 2 cm T
636-209	Solid Water	30 cm sq. x 2 cm T

EXRADIN MODEL A2

0.5 cm³ Chamber without Build-Up Cap

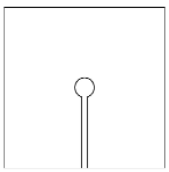


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-201	Polystyrene	25 cm sq. x 2.5 cm T
636-202	Acrylic	25 cm sq. x 2.5 cm T
636-203	Aluminum Stem Spacer	
636-204	Plastic Water	30 cm sq. x 2 cm T
636-205	Solid Water	30 cm sq. x 2 cm T

0.051 cm³ EXRADIN A10

0.051 cm³ Chamber

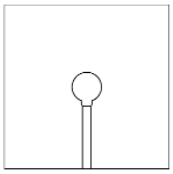


Chamber is flush with surface.

Item #	Phantom Material	Size
636-701	Polystyrene with Cable Cover	25 cm sq. x 2.5 cm T
636-702	Acrylic with Cable Cover	25 cm sq. x 2.5 cm T
636-704	Plastic Water	30 cm sq. x 2 cm T
636-704-2	Plastic Water Cable Cover	
636-706	Solid Water	30 cm sq. x 2 cm T
636-706-2	Solid Water Cable Cover	

EXRADIN MODEL A11

0.62 cm³ Chamber

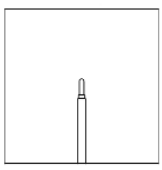


Chamber is flush with surface.

Item #	Phantom Material	Size
636-223	Polystyrene	25 cm sq. x 2.5 cm T
636-224	Acrylic	25 cm sq. x 2.5 cm T
636-225	Plastic Water	30 cm sq. x 2 cm T
636-226	Solid Water	30 cm sq. x 2 cm T

EXRADIN MODEL A12

0.65 cm³ Chamber without Build-Up Cap



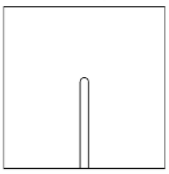
Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-215	Polystyrene	25 cm sq. x 2.5 cm T
636-216	Acrylic	25 cm sq. x 2.5 cm T
636-217	Plastic Water	30 cm sq. x 2 cm T
636-218	Solid Water	30 cm sq. x 2 cm T

PHANTOMS FOR EXRADIN IONIZATION CHAMBERS

EXRADIN MODEL A12

0.65 cm³ Chamber with Build-Up Cap



Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-219	Polystyrene	25 cm sq. x 2.5 cm T
636-220	Acrylic	25 cm sq. x 2.5 cm T
636-221	Plastic Water	30 cm sq. x 2 cm T
636-222	Solid Water	30 cm sq. x 2 cm T

EXRADIN MODEL A12S

0.25 cm³ Chamber without Build-Up Cap

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-240	Polystyrene	25 cm sq. x 2.5 cm T
636-241	Acrylic	25 cm sq. x 2.5 cm T
636-242	Plastic Water	30 cm sq. x 2 cm T
636-243	Solid Water	30 cm sq. x 2 cm T

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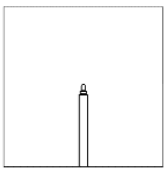
EXRADIN MODEL 14

0.009 cm³ Chamber without Build-Up Cap

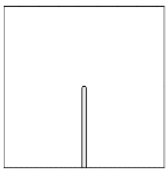


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-230	Polystyrene	25 cm sq. x 2.5 cm T
636-231	Acrylic	25 cm sq. x 2.5 cm T
636-232	Plastic Water	30 cm sq. x 3 cm T
636-233	Solid Water	30 cm sq. x 3 cm T

EXRADIN MODEL A14SL

0.009 cm³ Chamber without Build-Up Cap

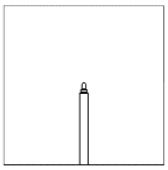


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-236	Polystyrene	25 cm sq. x 2.5 cm T
636-237	Acrylic	25 cm sq. x 2.5 cm T
636-238	Plastic Water	30 cm sq. x 2 cm T
636-239	Solid Water	30 cm sq. x 2 cm T

EXRADIN MODEL A16

0.007 cm³ Chamber without Build-Up Cap

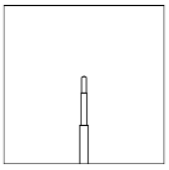


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-400	Polystyrene	25 cm sq. x 2.5 cm T
636-401	Acrylic	25 cm sq. x 2.5 cm T
636-402	Plastic Water	30 cm sq. x 2 cm T
636-403	Solid Water	30 cm sq. x 2 cm T
636-4011	Acrylic Chamber Plug	

EXRADIN A19

0.6 cm³ Farmer Style Chamber without Build-Up Cap



Most Common

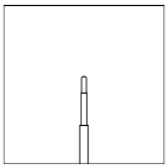
Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

PHANTOMS FOR CAPINTEC IONIZATION CHAMBERS

CAPINTEC PR-06G

0.6 cm³ Farmer Style Chamber without Build-Up Cap



Most Common

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

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CAPINTEC PR-06C OR G

0.6 cm³ Farmer Style Chamber without Build-Up Cap

Drawing Unavailable

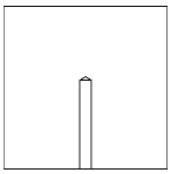
A large outer chamber hole accommodates the TNC or BNC style connector.

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-011	Polystyrene	25 cm sq. x 2.5 cm T
636-012	Acrylic	25 cm sq. x 2.5 cm T
636-014	Plastic Water	30 cm sq. x 3 cm T
636-014-2	Plastic Water Chamber Plug	
636-016	Solid Water	30 cm sq. x 3 cm T

CAPINTEC PR-06C OR G

0.6 cm³ Farmer Style Chamber with Build-Up Cap

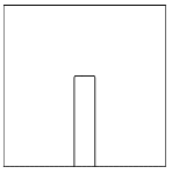


The chamber hole accommodates the TNC or BNC style connector.

Chamber Hole Depth:
1.2 cm from top to center of hole.

Item #	Phantom Material	Size
636-017	Polystyrene	25 cm sq. x 2.5 cm T
636-018	Acrylic	25 cm sq. x 2.5 cm T
636-019	Plastic Water	30 cm sq. x 3 cm T
636-020	Solid Water	30 cm sq. x 3 cm T

CAPINTEC PS-033



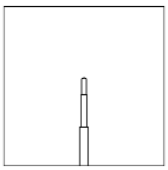
Chamber is flush with surface.

Item #	Phantom Material	Size
636-711	Polystyrene	25 cm sq. x 2.5 cm T
636-712	Acrylic	25 cm sq. x 2.5 cm T
636-713	Plastic Water	30 cm sq. x 2 cm T
636-714	Solid Water	30 cm sq. x 2 cm T

PHANTOMS FOR BICRON / NE AND THERMO SCIENTIFIC IONIZATION CHAMBERS

BICRON / NE 2571, 2581, 2505/3 A OR B

0.6 cm³ Farmer Style Chamber without Build-Up Cap



Most Common

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

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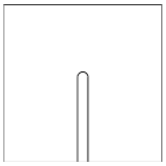
BICRON / NE 2505/3

0.6 cm³ Farmer Style Chamber with Build-Up Cap

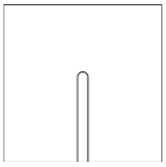


Chamber Hole Depth:
1.2 cm from top to center of hole and has a diameter of 1.65 cm.

Item #	Phantom Material	Size
636-101	Polystyrene	25 cm sq. x 2.5 cm T
636-102	Acrylic	25 cm sq. x 2.5 cm T
636-103	Solid Water	30 cm sq. x 3 cm T
636-104	Plastic Water	30 cm sq. x 3 cm T

BICRON / NE 2571

0.6 cm³ Farmer Style Chamber with Delrin Build-Up Cap

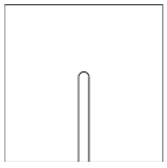


Chamber Hole Depth:
1.0 cm from top to center of hole and has a diameter of 1.53 cm.

Item #	Phantom Material	Size
636-121	Polystyrene	25 cm sq. x 2.5 cm T
636-122	Acrylic	25 cm sq. x 2.5 cm T
636-123	Solid Water	30 cm sq. x 3 cm T
636-124	Plastic Water	30 cm sq. x 3 cm T

BICRON / NE 2581

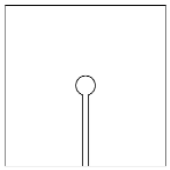
0.6 cm³ Farmer Style Chamber with Polystyrene Build-Up Cap



Chamber Hole Depth:
1.0 cm from top to center of hole and has a diameter of 1.86 cm.

Item #	Phantom Material	Size
636-131	Polystyrene	25 cm sq. x 2.5 cm T
636-132	Acrylic	25 cm sq. x 2.5 cm T
636-133	Solid Water	30 cm sq. x 3 cm T
636-134	Plastic Water	30 cm sq. x 3 cm T

THERMO SCIENTIFIC 2534



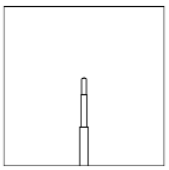
Chamber is flush with surface.

Item #	Phantom Material	Size
636-701	Polystyrene with Cable Cover	25 cm sq. x 2.5 cm T
636-702	Acrylic with Cable Cover	25 cm sq. x 2.5 cm T
636-704	Plastic Water	30 cm sq. x 2 cm T
636-704-2	Plastic Water Chamber Plug	
636-706	Solid Water	30 cm sq. x 2 cm T
636-706-2	Solid Water Chamber Plug	

PHANTOMS FOR NUCLEAR ASSOCIATES IONIZATION CHAMBERS

NUCLEAR ASSOCIATES 30-351

0.6 cm³ Farmer Style Chamber without Build-Up Cap



Most Common

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

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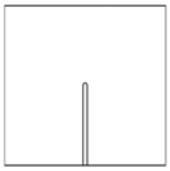
NUCLEAR ASSOCIATES 30-350

0.1 cm³ Chamber without Build-Up Cap

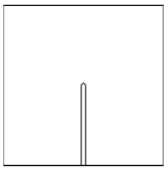


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-501	Polystyrene	25 cm sq. x 2.5 cm T
636-502	Acrylic	25 cm sq. x 2.5 cm T
636-503	Plastic Water	30 cm sq. x 2 cm T
636-503-2	Plastic Water Chamber Plug	
636-504	Solid Water	30 cm sq. x 2 cm T
636-504-2	Solid Water Chamber Plug	

NUCLEAR ASSOCIATES 30-344

0.125 cm³ Chamber without Build-Up Cap

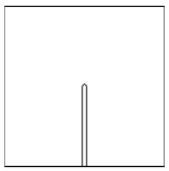


Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-511	Polystyrene	25 cm sq. x 2.5 cm T
636-512	Acrylic	25 cm sq. x 2.5 cm T
636-514	Plastic Water	30 cm sq. x 2 cm T
636-514-2	Plastic Water Chamber Plug	
636-515	Solid Water	30 cm sq. x 2 cm T

NUCLEAR ASSOCIATES 30-361 AND 30-317

0.3 cm³ Chamber without Build-Up Cap



Chamber Hole Depth:
0.7 cm from top to center of hole.

Item #	Phantom Material	Size
636-301	Polystyrene	25 cm sq. x 2.5 cm T
636-302	Acrylic	25 cm sq. x 2.5 cm T

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-311	Polystyrene	25 cm sq. x 2.5 cm T
636-312	Acrylic	25 cm sq. x 2.5 cm T
636-313	Plastic Water	30 cm sq. x 2 cm T
636-313-2	Plastic Water Chamber Plug	
636-314	Solid Water	30 cm sq. x 2 cm T
636-314-2	Solid Water Chamber Plug	

PHANTOMS FOR NUCLEAR ASSOCIATES IONIZATION CHAMBERS

NUCLEAR ASSOCIATES 30-334

0.02 cm³ Small Soft X-ray Chamber

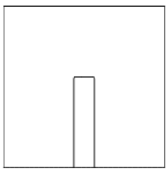
The chamber hole has special curved sides.

Chamber is flush with surface.

Item #	Phantom Material	Size
636-915	Polystyrene	25 cm sq. x 2.5 cm T
636-915-2	Polystyrene Chamber Plug	
636-916	Acrylic	25 cm sq. x 2.5 cm T
636-916-2	Acrylic Chamber Plug	
636-917	Plastic Water	25 cm sq. x 2 cm T
636-918	Solid Water	30 cm sq. x 2 cm T

NUCLEAR ASSOCIATES 30-330

0.2 cm³ Big Soft X-ray Chamber



Chamber is flush with surface.

Item #	Phantom Material	Size
636-911	Polystyrene	25 cm sq. x 2.5 cm T
636-912	Acrylic	25 cm sq. x 2.5 cm T
636-913	Plastic Water	25 cm sq. x 2 cm T
636-914	Solid Water	30 cm sq. x 2 cm T

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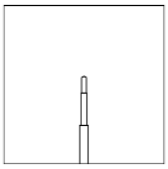
PHANTOMS FOR VICTOREEN AND RMI IONIZATION CHAMBERS

VICTOREEN 580-006 AND RMI 448

0.6 cm³ Farmer Style Chamber without Build-Up Cap

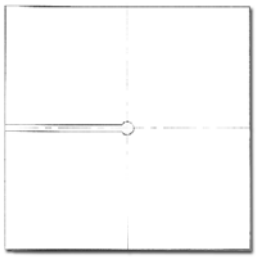


Most Common

Chamber Hole Depth:
1.0 cm from top to center of hole.

Item #	Phantom Material	Size
636-001	Polystyrene	25 cm sq. x 2.5 cm T
636-002	Acrylic	25 cm sq. x 2.5 cm T
636-004	Plastic Water	30 cm sq. x 3 cm T
636-004-1	Plastic Water	30 cm sq. x 2 cm T
636-004-2	Plastic Water Chamber Plug	
636-006	Solid Water	30 cm sq. x 3 cm T
636-006-1	Solid Water	30 cm sq. x 2 cm T
636-006-2	Solid Water Chamber Plug	
636-007	Virtual Water	30 cm sq. x 2 cm T
636-007-1	Virtual Water Chamber Plug	

EQUIDOSE II DIODE PHANTOM



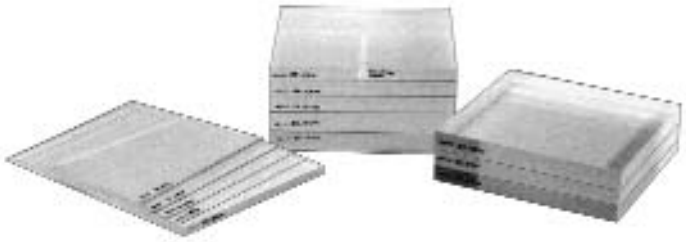
Specifications

Material: Polystyrene
Size: 9.8" x 9.8" x 1" (25 x 25 x 2.54 cm)

This phantom is also available in other materials. Call RPDinc for more information.

Item #	Description
638-000	Equidose II Diode Phantom

ACRYLIC PHANTOM



The Acrylic Phantom consists of:
(1) 1/32" (0.80 mm) x 25 cm sq acrylic sheet
(1) 1/16" (1.57 mm) x 25 cm sq acrylic sheet
(1) 1/8" (3.43 mm) x 25 cm sq acrylic sheet
(1) 1/4" (6.30 mm) x 25 cm sq acrylic sheet
(1) 1/2" (12.7 mm) x 25 cm sq acrylic sheet
(8) 1" (25 mm) x 25 cm sq acrylic sheet
(1) 1" (25 mm) x 25 cm sq with farmer chamber hole

The standard chamber hole will fit the following chambers:
Capintec - PR-06G
PTW - 23333 / 233633 / 30001 / 30010 / 30002 / 30011 / 30004, 30012, 30006 / 30013
Bicron - NE2571, 2505/3 A or B
Nuclear Associates - 30-351, 30-352 and 30-361

Chamber holes other than the standard are available upon request. **Please specify chamber to be used in phantom**. To accommodate a 2nd chamber, one of the 1" plates can be machined to fit the chamber.

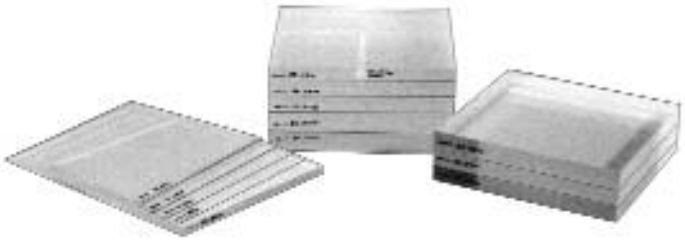
Markings
All of the Acrylic Sheets are marked "ACRYLIC" and state the material thickness with a special black ink that is etched into the acrylic.

Specifications

Material: Clear acrylic
Density: 1.17 to 1.20 g/cm³
Size: 25 cm sq x approx. 25 cm T.

Item #	Description
602-0000	Acrylic Phantom
600-0010	Machining Extra Standard Chamber Hole

POLYSTYRENE AND ACRYLIC SHEETS



All of the Sheets are marked "POLYSTYRENE" or "ACRYLIC" and state the material thickness with a special black ink that is etched into the material.

The thickness of the sheets is not exact and varies within the tolerance of industry standards. If a precise thickness is needed please state the thickness desired when placing your order.

All 1" and 2" Polystyrene Sheets are machined flat on the top and the bottom. This reduces air gaps when stacking the sheets.

Specifications

Polystyrene Density: 1.05 g/cm³
Size: 25 cm sq.

Acrylic Density: 1.185 g/cm³
Size: 25 cm sq.

Item #	Description	Approximate Thickness
601-0020	Polystyrene Sheet - Color: Clear	1/51" (0.50 mm)
601-0032	Polystyrene Sheet - Color: White	1/32" (0.80 mm)
601-0062	Polystyrene Sheet - Color: White	1/16" (1.57 mm)
601-0125	Polystyrene Sheet - Color: White	1/8" (3.18 mm)
601-0187	Polystyrene Sheet - Color: White	3/16" (4.75 mm)
601-0250	Polystyrene Sheet - Color: White	1/4" (6.35 mm)
601-0500	Polystyrene Sheet - Color: White	1/2" (12.7 mm)
601-1000	Polystyrene Sheet - Color: White	1" (25 mm)
601-2000	Polystyrene Sheet - Color: White	2" (50 mm)

Item #	Description	Approximate Thickness
602-0032	Acrylic Sheet - Color: Clear	1/32" (0.80 mm)
602-0062	Acrylic Sheet - Color: Clear	1/16" (1.57 mm)
602-0125	Acrylic Sheet - Color: Clear	1/8" (3.18 mm)
602-0250	Acrylic Sheet - Color: Clear	1/4" (6.30 mm)
602-0500	Acrylic Sheet - Color: Clear	1/2" (12.7 mm)
602-1000	Acrylic Sheet - Color: Clear	1" (25 mm)
602-2000	Acrylic Sheet - Color: Clear	2" (50 mm)

CTG SOLID WATER®

Density: 1.04 g/cm³

The Certified Therapy Grade Solid Water® is manufactured to the most exact quality assurance standards in the industry and is ideally suited to TG-51 protocol recommendations. Each slab undergoes meticulous analysis to ensure the highest possible quality. A Certificate of Conformance is provided with each slab and includes calculated elemental composition, calculated mass, volume electron densities, electron and photon transmission characteristics and measured physical dimensions. A radiograph is also provided demonstrating the product is free from voids, contamination or other artifacts.

CTG Solid Water® is designed for electron and photon beam measurements including relative ionization, depth dose and uniformity.

Reference Material

Attix, M.S., Constantinou, Chris, & Paliwal, Bhudatt R. (1982). A solid water phantom material for radiotherapy x-ray and y-ray beam calibrations. Med. Phys. 9 (3), 436-441.

Darlison, R., Martin R.J,. & White D.R. (1977). Epoxy resin based tissue substitutes. British Journal of Radiology, 50, 814-821.

Hanson, W.F,. Tailor, R.C., & Tello, V.M. (1995). How water equivalent are water-equivalent solid materials for output calibration of photon and electron beams? Med. Phys. 22, (7), 1177-1189.

Specifications

Electron and Photon Stopping Power
Linear attenuation coefficient relative to water shall be 1.030 ±0.01 for photon energies from100 kV to 24 MV.

Homogeneity
Material shall be free from air bubbles or other artifacts greater than 1 mm in diameter within 5 cm of the center of the slab. No more than two (2) air bubbles or other artifacts greater than 2 mm in diameter outside the 5 cm radius, but within 10 cm of center. Scanning for homogeneity shall be done by x-ray at 50 kVp, no filtration, with a dose sufficient to produce an x-ray image of 0.8 to 1.2 o.d.

Dimensions
Tolerance for the length and width, or diameter of the CTG Solid Water® material shall be the nominal ±0.5 mm

Thickness Tolerance: ±0.006" (0.15 mm)
Flatness: ±0.006" (0.15 mm)
Squareness: Where applicable, shall be within 90° ±0.3°
Sizes: 20x20 cm, 30x30 cm and 40x40 cm
Thicknesses: 0.2 cm to 6.0 cm

Thickness	Item #	Size	Item #	Size	Item #	Size
0.2 cm	604-202	20 cm sq.	604-302	30 cm sq.	Not Available	
0.3 cm	604-203	20 cm sq.	604-303	30 cm sq.	Not Available	
0.5 cm	604-205	20 cm sq.	604-305	30 cm sq.	604-405	40 cm sq.
1.0 cm	604-210	20 cm sq.	604-310	30 cm sq.	604-410	40 cm sq.
1.5 cm	604-215	20 cm sq.	604-315	30 cm sq.	604-415	40 cm sq.
2.0 cm	604-220	20 cm sq.	604-320	30 cm sq.	604-420	40 cm sq.
3.0 cm	604-230	20 cm sq.	604-330	30 cm sq.	604-430	40 cm sq.
4.0 cm	604-240	20 cm sq.	604-340	30 cm sq.	604-440	40 cm sq.
5.0 cm	604-250	20 cm sq.	604-350	30 cm sq.	604-450	40 cm sq.
6.0 cm	604-260	20 cm sq.	604-360	30 cm sq.	Not Available	

Item	Description
604-460	Solid Water, Drilling for Thimble Chamber Specify Chamber and depth in Solid Water Material
604-465	Solid Water, Milling for Circular Parallel Plate Chamber Specify Chamber

Solid Water Material is Ordered Separately

PLASTIC WATER®

Density 1.02 g/cm³

Plastic Water® - 150 keV - 100 MeV

- Agrees with true water within 0.5% above 7 MeV
- Easy to machine
- Custom cavities are available to accommodate any ion chamber
- Un-breakable
- Includes a 5-Year Warranty

Plastic Water® is flexible and will not break under impact and is the only calibration material available in 1 mm thicknesses. Plastic Water® is the only material which agrees with true water within 0.5% above 7 MeV.

Specifications

Material: Epoxy resins and powders to control density and radiation properties
Density: 1.02 g/cm³

Thickness	Item #	Size	Item #	Size
0.1 cm	603-301	30 cm sq.	603-401	40 cm sq.
0.2 cm	603-302	30 cm sq.	603-402	40 cm sq.
0.3 cm	603-303	30 cm sq.	603-403	40 cm sq.
0.5 cm	603-305	30 cm sq.	603-405	40 cm sq.
1.0 cm	603-310	30 cm sq.	603-410	40 cm sq.
2.0 cm	603-320	30 cm sq.	603-420	40 cm sq.
3.0 cm	603-330	30 cm sq.	603-430	40 cm sq.
4.0 cm	603-340	30 cm sq.	603-440	40 cm sq.
5.0 cm	603-350	30 cm sq.	603-450	40 cm sq.
6.0 cm	603-360	30 cm sq.	603-460	40 cm sq.
7.0 cm	603-370	30 cm sq.	603-470	40 cm sq.

Item #	Plastic Water®
603-325	30 x 30 x 2 cm Thick with Cavity for Ion Chamber
603-326	Plug for Chamber Cavity in 30 x 30 cm Phantom
603-425	40 x 40 x 2 cm Thick with Cavity for Ion Chamber
603-426	Plug for Chamber Cavity in 40 x 40 cm Phantom
603-500	DRILLING, 30 x 30 x >2 cm Thick with Cavity at 1 cm from Top
603-505	DRILLING, 30 x 30 x >2 cm Thick with Cavity at Midplane

VIRTUAL WATER™

Virtual Water™ is designed for photon and electron beam calibrations. It eliminates the inconvenience of transporting, setting-up, and filling water tanks. Virtual Water™ is free of air and other imperfections and is not affected by humidity or temperature changes.

Virtual Water™ scatters and attenuates diagnostic and radiotherapy range x-rays the same way as water without the charge storage problems. It can be used for both photon and electron beam calibrations, including relative ionization, depth dose measurements, and absolute calibrations without the need for correction and scaling factors. Ionization readings obtained in Virtual Water™ are practically the same as those in liquid water for the same depth and exposure duration.

Each batch of Virtual Water™ is tested at an independent calibration lab and verified to be within 0.5% of water at photon energies.

Custom cavities are available to accommodate various types of ion chambers in any size section and in thicknesses of 2cm or more. Customer must specify ion chamber.

No positive (plug) is supplied with the chamber cavity. Plugs can be ordered separately.

Specifications

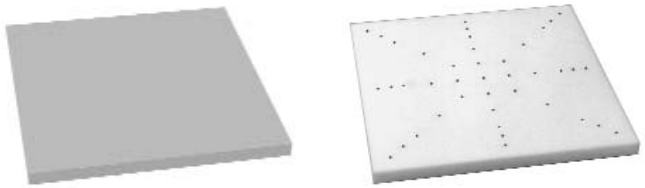
Material: Epoxy resins and powders to control density and radiation properties
Density: 1.04g/cm³
Flatness: 0.2mm (0.008 in)
Length and Width Tolerance: ± 0.02" (0.5 mm)
Thickness Tolerance: ± 0.006" (0.15 mm)
Batch Consistency: ± 0.02% (measured)

Thickness	Item #	Size	Item #	Size	Item #	Size
0.1 cm	605-201	20 cm sq.	605-301	30 cm sq.	Not Available	
0.2 cm	605-202	20 cm sq.	605-302	30 cm sq.	605-402	40 cm sq.
0.3 cm	605-203	20 cm sq.	605-303	30 cm sq.	605-403	40 cm sq.
0.5 cm	605-205	20 cm sq.	605-305	30 cm sq.	605-405	40 cm sq.
1.0 cm	605-210	20 cm sq.	605-310	30 cm sq.	605-410	40 cm sq.
2.0 cm	605-220	20 cm sq.	605-320	30 cm sq.	605-420	40 cm sq.
3.0 cm	605-230	20 cm sq.	605-330	30 cm sq.	605-430	40 cm sq.
4.0 cm	605-240	20 cm sq.	605-340	30 cm sq.	605-440	40 cm sq.
5.0 cm	605-250	20 cm sq.	605-350	30 cm sq.	605-450	40 cm sq.
6.0 cm	605-260	20 cm sq.	605-360	30 cm sq.	Not Available	

Virtual Water™ is a trademark of Med-Cal, Inc.

Item #	Virtual Water™
605-500	DRILLING for Chamber
605-505	MILLING for Chamber
605-510	Fly-Cut A-10 & A-11
605-520	Scribe 10 x 10 & Crosshairs
605-503	Plug for Drilled Chamber Hole
605-508	Plug for Milled Chamber Hole
605-515	Custom Plug

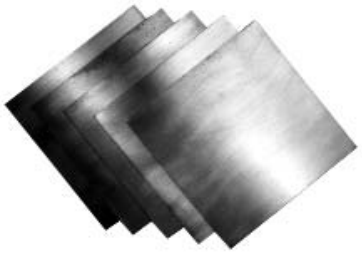
FLATNESS PHANTOM PLATE



Item	Material	cm²	Thickness
657-005	Acrylic	45	0.5"
657-010	Acrylic	45	1.0"
657-012	Acrylic	40	0.5"
657-013	Acrylic	40	1.0"
657-014	Acrylic	50	1.0"
657-303	Polystyrene	30	1.0"
657-304	Polystyrene	40	1.0"
657-305	Polystyrene	50	1.0"

Tungsten Pins can be Customed Drilled in Phantom
Custom Made Items are Nonreturnable

METAL SHEETING



Specifications

Half-Hard Brass Sheets
Type 260: 70% Copper, 30% Zinc
Density: 8.515 g/cm³
Size: 6” sq.

Copper Sheets
Type C110: 99.9% Copper
Density: 8.9 g/cm³
Size: 6" sq.

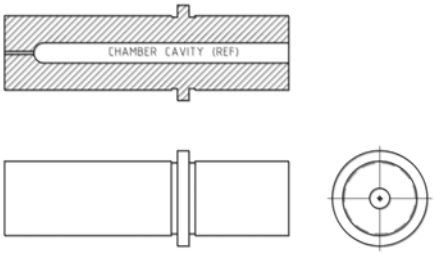
Aluminum Sheets
Density: 2.718 g/cm³
Size: 6" sq.

Item	Material	Thickness
650-0020	Brass	0.020" (0.50 mm)
650-0032	Brass	0.032" (0.80 mm)
650-0064	Brass	0.064" (1.65 mm)
650-0125	Brass	0.125" (3.10 mm)
650-0190	Brass	0.187" (4.76 mm)
650-0250	Brass	0.250" (6.35 mm)
650-0500	Brass	0.500" (12.7 mm)
650-1000	Brass	1.000" (25.4 mm)
651-0020	1100 Aluminum	0.020" (0.50 mm)
651-0040	1100 Aluminum	0.040" (1.02 mm)
651-0080	1100 Aluminum	0.080" (2.03 mm)

Item	Material	Thickness
651-0250	6061 Aluminum	0.250" (6.35 mm)
651-0375	6061 Aluminum	0.375" (9.52 mm)
651-0500	6061 Aluminum	0.500" (12.7 mm)
651-1000	6061 Aluminum	1.000" (25.4 mm)
652-0011	Copper	0.010" (0.25 mm)
652-0021	Copper	0.021" (0.55 mm)
652-0032	Copper	0.032" (0.84 mm)
652-0064	Copper	0.064" (1.64 mm)
652-0125	Copper	0.125" (3.18 mm)
652-0187	Copper	0.187" (4.76 mm)

GAMMA KNIFE PHANTOMS

Phantom Plate



Phantom Cylinder

Specifications

Item 638-100 Phantom Plate, Blank
Material: Black ABS or Customer Supplied Material
Density: 1.04 gm/cm³
Size: 6.3" L x 5.12" W x 0.39" T (16 x 13 x 1 cm)

Item 638-200 Phantom Cylinder, Blank
Material: Solid Water or Customer Supplied Material
Density: 1.03 gm/cm³
Size: 0.9 / 1.2" diameter x 3.6" L (2.4 / 3.1 x 9.2 cm)

Item	Leksell Gamma Knife Phantom
638-100	Phantom Plate, Blank
638-102	Phantom Plate, Capintec PR05P
638-103	Phantom Plate, PTW 233642/31002/31005/31010
638-104	Phantom Plate, PTW 31006
638-200	Phantom Cylinder, Blank
638-201	Phantom Cylinder, Exradian A14SL
638-202	Phantom Cylinder, Exradian A1SL
638-203	Phantom Cylinder, PTW 31006 Pinpoint
638-204	Phantom Cylinder, PTW 233642/31002/31005/31010

Customer Can Provide Phantom Material for Drilling and Custom Drilling is Available

ALUMINUM FILM COMPRESSOR

The Aluminum Film Compressor is used to compress polystyrene, acrylic, plastic water, or solid water phantom pieces together with a Ready Pack Film placed in the center.

Specification

For: 25 cm sq., 30 cm sq. and 35 cm sq.
Size: 15.65" W x 9.5" L
Inside Width: 30 cm
Plates: 1/2" T. Aluminum

Item #	Description
622-302	Aluminum Film Compressor

FILM DOSIMETRY CASSETTES

The two piece, Film Dosimetry Cassette keeps the edge of the film at the surface of the cassette. A light hole at the bottom marks the film orientation.

To insert film loosen screws 1/2 turn and slide film in. The film will stop at the stoppers between the two pieces. The edge of the film should be flush with top edge of the cassette. Tighten the screws. To remove film, loosen screws, turn the cassette over and the film will slide out.

The Film Dosimetry Cassette is light sealed with rubber tubing on 3 sides. The film entry side must be covered with black tape to prevent light exposure.

The Film Dosimetry Cassette can be used in any plane: parallel, perpendicular or angled.

Scribing is available upon request. Custom thicknesses are available upon request.

BLACK ACRYLIC FILM DOSIMETRY CASSETTE

Density: 1.17 to 1.20 g/cm^3

Item #	Size	Sides	Film Size
623-025	25cm W x 30cm L x 3.6cm T	1.8cm & 1.8cm	8" x 10"
623-030	30cm W x 30cm L x 2.4cm T	1.2cm & 1.2cm	8" x 10"
623-035	30cm W x 40cm L x 5cm T	2.5cm & 2.5cm	10" x 12"

BLACK ABS* FILM DOSIMETRY CASSETTE

***(ACRYLONITRILE-BUTADINE STYRENE) Density: 1.04 g/cm^3**

Item #	Size	Sides	Film Size
623-128	30cm W x 30cm L x 4cm T	2.0cm & 2.0cm	8" x 10"
623-130	30cm W x 30cm L x 5cm T	2.5cm & 2.5cm	8" x 10"
623-135	30cm W x 40cm L x 5cm T	2.5cm & 2.5cm	10" x 12"

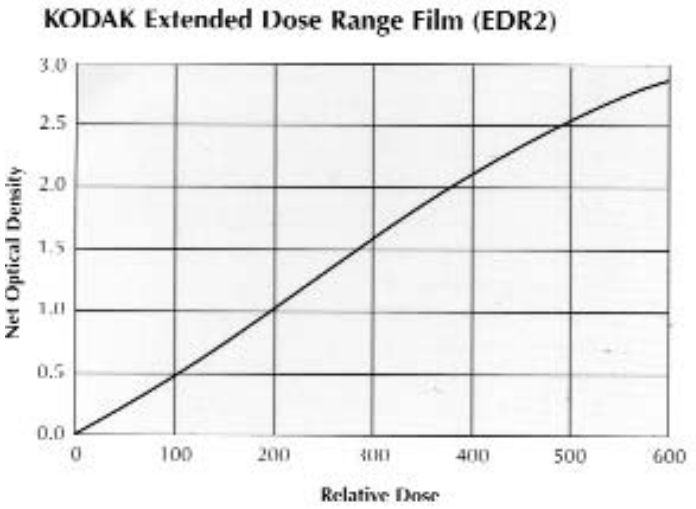
SOLID WATER 457-CTG FILM DOSIMETRY CASSETTE

Density: 1.015 g/cm^3

Item #	Size	Sides	Film Size
623-230	30cm W x 30cm L x 3cm T	1cm & 2cm	8" x 10"
623-235	30cm W x 40cm L x 5cm T	2cm & 3cm	10" x 12"

KODAK EDR2 FILM

Extended Dose Range (EDR) Ready-Pack Film for Monitoring and Evaluation of Exposures at Therapy Energies



The curve above shows the approximate relative dose response for EDR2 film. The curve is representative only - - the exact results will depend on the exposing, processing, and scanning conditions at each facility. EDR2 film will saturate in direct exposure at ~ 700 cGy

EDR2 film is designed specifically for oncology applications. Compared to most x-ray films, it is relatively insensitive to x-ray energies and, hence, has a response which extends to very high exposures. Intended for direct exposure applications, it is not suitable for portal imaging radiographs.

EDR2 Features:

- Film is a convenient means of calibration and monitoring of exposures
- Large area
- Low cost, widely available
- Excellent for relative dosimetry (e.g., field uniformity, equipment characterization: field shapes, port openings, MLCs)
- With appropriate calibration, film may be applicable to absolute dosimetry (e.g., high-dose treatment strategies such as IMRT

Features of EDR2 direct exposure applications:

- Wide response range
- Approximately linear
- Robust processing

Dose Response for Evaluation

Exact dose responses are a function of facility dependent factors including processing conditions (processing time, processing temperature, processing equipment, processing chemistry), the density sampling (digitizer equipment and calibration), and exposure monitoring equipment. The exact response relationship should be measured and verified for the local conditions. The films should be processed using recommendations found in Kodak Service Bulletin #30 (refer to EC film guidelines).

Measurement Technique

The dose response of a film should be measured using appropriate amounts of build-up and backscatter material. Many references have discussed methodology for measuring the response of a film. A few of these are:

M.D.C. Evans and L.J. Schreiner, “A simple technique for film dosimetry,” Radiotherapy. Oncol. Vol 23, pages 265-267, 1992.

J. I. Hale, A. T. Kerr, and P. C. Shragge, “Calibration of film for accurate mega voltage photon dosimetry,” Med. Dosimetry Vol 19, pages 43-46, 1994.

Inhwan J. Yeo, C-K Chris Wang, and Sandra E. Burch, “A filtration method for improving film dosimetry in photon radiation therapy,” Medical Physics Vol 24, pages 1943-1953, December 1997.

J. L. Robar and B. G. Clark, “The use of radiographic film for linear accelerator stereotactic radiosurgical dosimetry,” Medical Physics Vol 26, pages 2144-2150, 1999.

CE

Item #	Description
624-100	Kodak EDR2 Film - 10" x 12" (50/box, 4 box min order)
624-105	Kodak EDR2 Film -35cm x 43cm(50/box, 2 box min order)

GAFCHROMIC® EBT2 AND EBT3 FILM

R

- **No processing required**
- **Wide exposure range**
- **Exceptional image resolution**
- **Large measurement area**
- **Less sensitive to indoor lighting**
- **Built-in uniformity indicator**

ADDIATIONAL FEATURES OF EBT3
- **Symmetrical**
- **Anti-newton coated**

GAFCHROMIC® EBT2 and EBT3 dosimetry film has been designed specifically as a time-and-cost-saving tool that addresses the needs of medical physicists and dosimetrists working in radiotherapy environments.

It is targeted toward applications in external beam radiotherapy and supports the processor-less environment of the modern hospital.

TECHNICAL BENEFITS
- Supports all major RT technologies
- Large measurement area
- Develops in real time with no processing (eliminates processing discrepancies)
- Density changes stabilize rapidly
- Energy-independent dose response
- Reduces scattered radiation
- Near tissue-equivalent
- Uniformity better than ± 3% in dose
- High spatial resolution
- Can be handled in room light
- Eliminates the need for a darkroom
- Water resistant, water immersible
- Usable with water phantoms
- Withstands temperatures up to 70°C

EBT2 SPECIFIC TECHNICAL BENEFITS
- Wide dose range, 1 cGy to 40 Gy
- Special uniformity indicator
- Improved indoor lighting resistance

EBT3 SPECIFIC TECHNICAL BENEFITS
- Wide dose range, 1 cGy to > 40 Gy
- Symmetrical
- Helps avoid Newton's rings

ECONOMIC BENEFITS
- Eliminates the expense of a processor
- Eliminates the costs and dangers of photo chemical wastes
- Convenient to handle and easy to cut
- Easily noted on with marker pen (notes easily erased if necessary)
- Cut and shape the film to your needs
- Economical and competitive pricing
- Use with professional flatbed scanner
- Saves time and money, with improved accuracy and outstanding convenience
- Available in two sheet sizes

CONFIGURATION AND STRUCTURE

GAFCHROMIC® EBT2 and EBT3 is made by laminating an active layer between two polyester layers. The polyester surface makes an exceptionally robust product and allows water immersion.

OPTIMIZING THE SENSITOMETRIC RESPONSE

Since the absorbance spectra of the active component of GAFCHROMIC® EBT2 and EBT3 peaks at 636 nm, the sensitivity is maximized by measurement with red light. Transmission densitometers that are commonly used to measure visual density with conventional films are suitable for use with EBT2 or EBT3 film. Better results can be obtained from the red color channel with a color densitometer. Further improvement of results can be obtained by using a narrow band pass filter with central wavelength at about 636 nm and 10 nm bandwidth while making measurements.

EBT2 FEATURES

A PRECISION 5-LAYER LAMINATED COMPOSITION

A clear polyester . . . . . 50 microns
B adhesive layer . . . . . 25 microns
C top coat . . . . . 5 microns
D active substrate layer . . . . . 30 microns
E clear polyester . . . . . 175 microns

Approximate thicknesses, actual values may vary slightly.

EBT3 FEATURES

A PRECISION 3-LAYER LAMINATED COMPOSITION

A clear polyester . . . . . 125 microns
B active substrate layer . . . . . 30 microns
C clear polyester . . . . . 125 microns

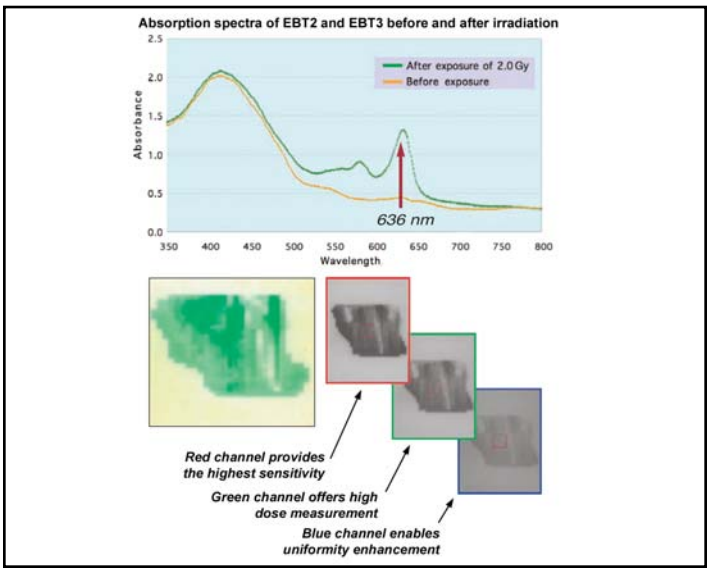
Approximate thicknesses, actual values may vary slightly.

VERSATILE PERFORMANCE

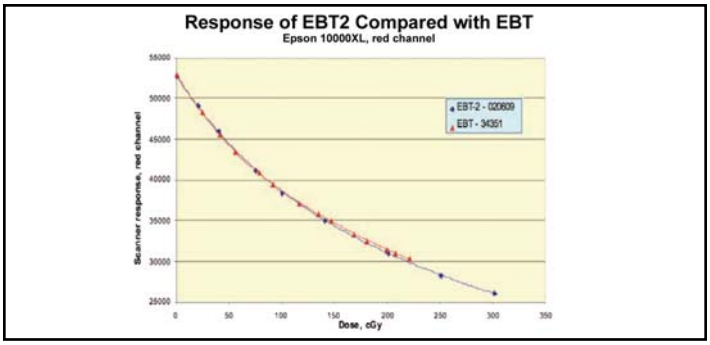
GAFCHROMIC® EBT2 nad EBT3 dosimetry film can also be read with a film scanner or digitizer. As with densitometers, the response of the film can be enhanced if the spectral response of the scanner is matched to the absorbance of the film.

Many high-quality scanners are available to digitize colored films. The Epson® 10000XL PHOTO flatbed color scanner, which is designed to digitize film 8" x 10" in size, and even as large as 12" x 16" in size, is recommended to scan EBT2 and EBT3 film. For doses up to 8 Gy, the Epson® 10000XL provides the most sensitive response for EBT2 and EBT3 film from the red color channel. The green channel can be used to measure doses between 8 Gy and 40 Gy for EBT2 and between 8 Gy and > 40Gy for EBT3. The blue channel provides a response signal for automatic film uniformity enhancement via a special marker dye in the active layer of EBT2 and EBT3 film. The recommended scan orientation for the film is landscape.

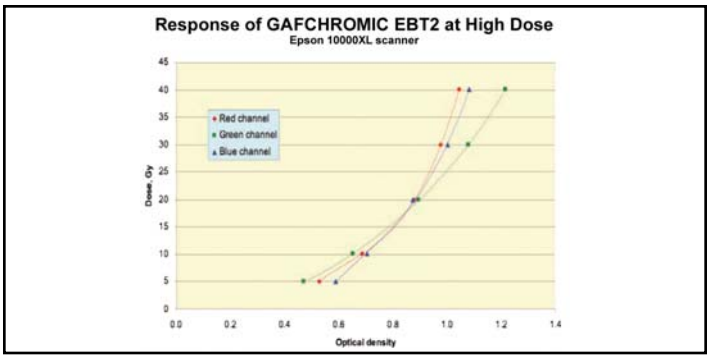
EPSON 10000XL
PHOTO FLATBED COLOR SCANNER PERFORMANCE



NOTE: The response of GAFCHROMIC® EBT2 and EBT3 dosimetry film is dependent upon factors specific to the facility such as the energy spectrum of the radiation source, the characteristics of the densitometer, film scanner or other means of measurement and the elapsed time between exposure and measurement etc. Therefore, the user should determine the dose-density response under the conditions pertaining to the user's facility and measurement protocol. Since the absolute response of GAFCHROMIC® EBT2 and EBT3 dosimetry film may vary from lot to lot, the user should re-measure response when changing to a new lot number.



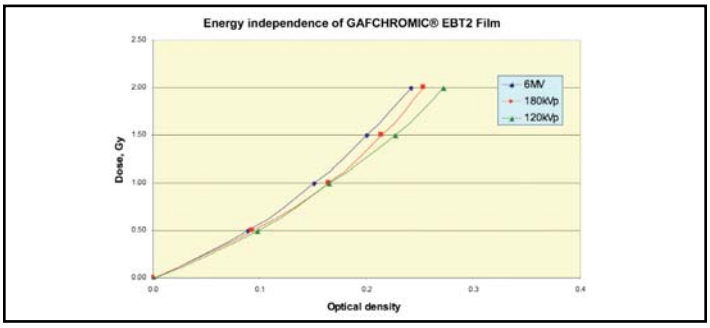
Responses of CAFCHROMIC® EBT2 and EBT to dose up to 3Gy



Response of GAFCHROMIC® EBT2 to doses between 5Gy and 40 Gy, with the Epson® XL10000 PHOTO flatbed color scanner

ENERGY INDEPENDENCE

GAFCHROMIC® EBT2 radiochromic film has been designed to measure absorbed dose from high-energy radiation used in RT. The response to photons has been found to be highly energy-independent in the MeV range and measurements at lower energies show that the response changes by only ten percent, even down to keV range.



DOSE FRACTIONATION

EBT2 film exposed to a single fraction yields the equivalent amount of response as the film given fractionated exposure and establishes EBT2 film as an effective dose integrator.

POST-EXPOSURE DENSITY GROWTH

GAFCHROMIC® EBT2 film self-develops in real time. The time interval between the exposure and the scan should be kept approximately the same for all films in an analysis.

STORAGE AND HANDLING

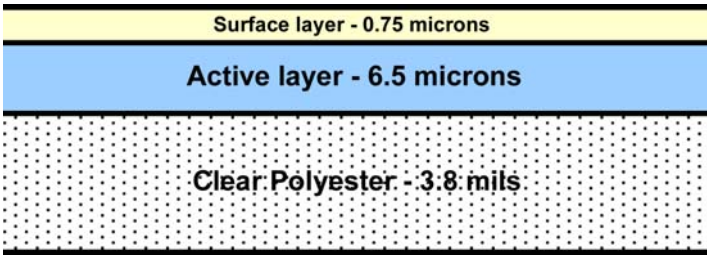
GAFCHROMIC® EBT2 film is designed to be handled in interior room light, however it is recommended that the film be kept in darkness when not in use. Exposure to sunlight should be avoided. The film may be stored at room temperature (20°- 25°C), but the best practice is to store the film at refrigerator temperature. The film's shelf-life is two years when stored at room ambient temperature. It can tolerate brief exposures (e.g. <1 min.) to temperatures up to 70°C, or more prolonged exposure (e.g. <1 day) at temperatures of 50°C. However, it is recommended that the film be handled, exposed and measured at room ambient temperature (20°- 25°C).

Item #	Gafchromic® EBT2 Film	Sheets
115-015	8" x 10" (20.3 x 25.4 cm)	25
115-017	14" x 17" (35.6 x 43.2 cm)	10

Item #	Gafchromic® EBT3 Film	Sheets
115-018	8" x 10" (20.3 x 25.4 cm)	25
115-019	14" x 17" (35.6 x 43.2 cm)	10

GAFCHROMIC® HD-810 FILM

The GAFCHROMIC® HD-810 high-dose dosimetry film has been designed for use with beams of photons, electrons, protons, ions, and neutrons. It can be used to measure and map sources of various types covering a wide range of charged particle energies down to 5keV or lower. GAFCHROMIC® HD-810 dosimetry film is designed for the measurement of absorbed dose of high-energy photons. In this regard, the response of the film is energy independent for photons above approximately 0.2 MeV.



Configuration of GAFCHROMIC® HD-810 dosimetry film

The active layer, approximately 6.5 microns thick, is coated on clear, transparent 3.8 mil (~ 97 microns) polyester. There is a gelatin surface layer approximately 0.75 microns thick. The thickness of the active layer may vary slightly from batch-to-batch.

GAFCHROMIC® HD-810 radiochromic dosimetry film may be measured with transmission densitometers, film scanners or spectrophotometers. When the active component in GAFCHROMIC® HD-810 film is exposed to radiation, it reacts to form a blue colored polymer with absorption maxima at approximately 615 nm and 675 nm. Therefore, the response of the dosimetry film media is enhanced by measurement with red light. In using a spectrophotometer the greatest response is obtained by scanning the film and using the peak absorbances. Most densitometers measure over a band of wavelengths and transmission densitometers for measuring colored films measure over various narrow color bands within the visible spectrum, e.g. visual, red, green and blue. Such densitometers are commonly and widely employed in the photographic industry.

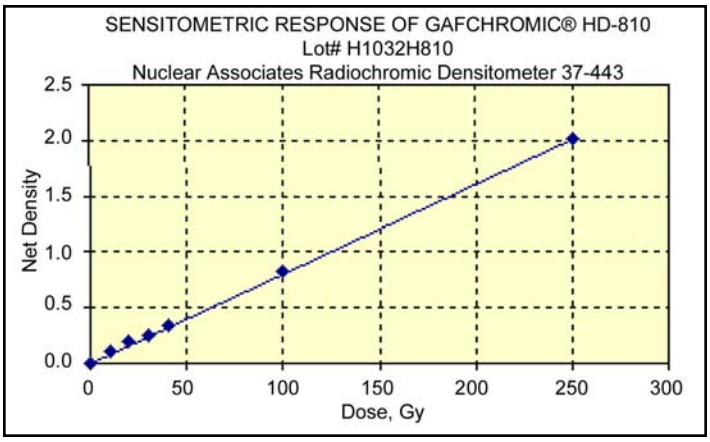
Specifications

Configuration: Active layer and surface layer on polyester substrate
Substrates: 380 gauge clear transparent polyester
Active Layer Thicknesses: Nominally 6.5 microns[1]
Surface Layer: Nominally 0.75 microns
Sensitometric Response: Net density[2] of 0.30 at 100 Gy and 1.15 at 500 Gy
Energy Dependency: <5% difference in net density[2] for 250 Gy exposures at 1 MeV and 18 Mev
Dose Fractionation Response: <5% difference in net density[2] for a single 40 Gy dose and five cumulative 8 Gy doses at 30 min. intervals
Dose Rate Response: <5% difference in net density[2] for 10 Gy exposures at rates of 3.4 Gy/min. and 0.034 Gy/min.
Stability in Light: <0.005 change in density per 1000 lux-day[2,4]
Stability in Dark (Preexposure): $<0.5 \times 10^{-3}$ density change/day at 23°C; $<0.2 \times 10^{-3}$ density change/day refrigerated
Uniformity, Single Sheet: <8% sensitometric response difference[3]
Uniformity, Sheet-to-Sheet: <5% sensitometric response difference from mean
Uniformity, Batch-to-Batch: <10% sensitometric response difference from mean
Post Exposure Density Growth: <12% from 1 hr to 1 day after exposure; <4% 1 day to 4 days after exposure

1. Actual thickness may vary slightly from batch-to-batch in order to match sensitivity specification.
2. Visual transmission density measured with X-Rite 310T densitometer. Net density is the change in density due to the absorbed radiation dose.
3. 2s.100/density - 49 measurements in a 7x7 grid on a 5" x 5" sheet
4. Cool white fluorescent light

SENSITOMETRIC RESPONSE

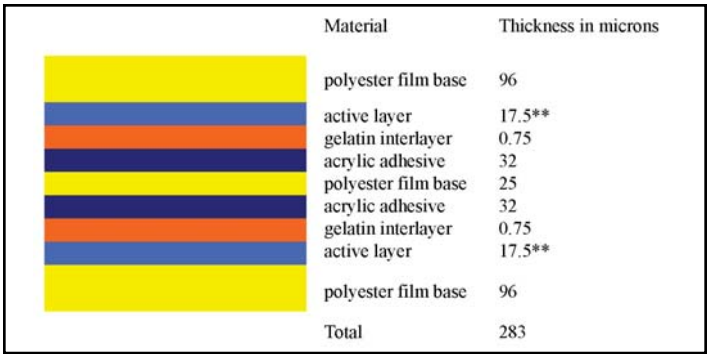
The graph below is for CO^{60} exposure of GAFCHROMIC® HD-810 radiochromic dosimetry film batch H1032H810. The density measurements were made with a Nuclear Associates Radiochromic Densitometer Model 37-443. Net density is the change in density owing to the exposure dose, i.e. density after exposure minus (base + fog). The response of the GAFCHROMIC® HD-810 dosimetry film is essentially linear with dose up to 250Gy when measured with this type of densitometer.



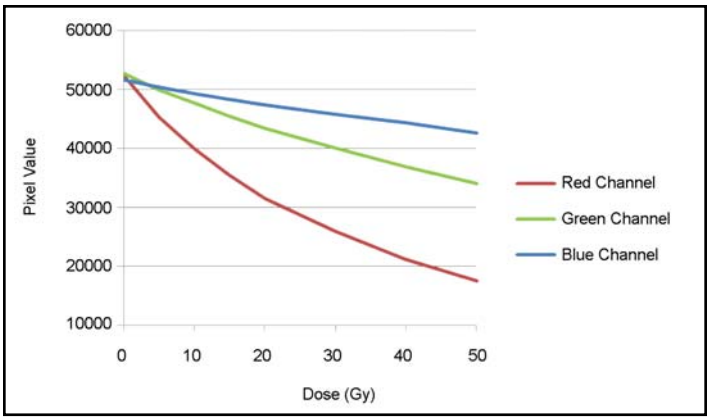
Item #	Gafchromic®	Sheets
115-005	HD-810	5

GAFCHROMIC® MD-V2-55 FILM

GAFCHROMIC® MD-V2-55 radiochromic dosimetry film is designed for the measurement of absorbed dose of high-energy photons. In this regard, the response of the film is energy-independent for photons above about 0.2MeV. The structure of GAFCHROMIC® MD-V2-55 radiochromic dosimetry film is shown in figure below:



Configuration



Typical Color Sensitometric Response

An active layer, approximately 17.5 microns thick, is coated on clear, transparent 96 microns polyester. Two pieces of this film are then laminated together with a two-sided adhesive tape composed of the adhesive layers, each approximately 32 microns thick, surrounding a 25 microns thick clear, transparent polyester base. GAFCHROMIC® MD-V2-55 dosimetry film employs the same active component as in GAFCHROMIC® HD-810 films. In total, GAFCHROMIC® MD-V2-55 has about a 35 micron thickness of active layer. The thickness of the active layer may vary slightly from batch-to-batch.

GAFCHROMIC® MD-V2-55 radiochromic dosimetry film may be measured with transmission densitometers, film scanners or spectrophotometers. When the active component is exposed to radiation, it reacts to form a blue colored polymer with absorption maxima at about 615 nm and 675 nm. Therefore, the response of GAFCHROMIC® MD-V2-55 dosimetry media is enhanced by measurement with red light. Transmission densitometers for measuring colored films in various color bands within the visible spectrum (e.g. visual, red, green and blue) and are commonly and widely employed in the photographic industry.

The GAFCHROMIC® MD-V2-55 dosimetry film can be handled in normal room light for at least several hours without noticeable effects. However, it is suggested that the film should not be left exposed to room light indefinitely, but rather should be kept in the dark when it is not being handled.

R

Specifications

Configuration: Two active layers on polyester substrates laminated with adhesive tape
Substrates: 96 microns clear transparent polyester
Active Layer Thicknesses: Nominally 2 x 17.5 microns[1]
Laminating Tape: 25 microns polyester with double sided adhesive layers approximately 32 microns thick
Energy Dependency: < 5 % difference in net density[1] for 50 Gy exposures at 1 MeV and 18 Mev
Dose Fractionation Response: < 5 % difference in net density[1] for a single 40 Gy dose and five cumulative 8 Gy doses at 30 minute intervals
Dose Rate Response: < 5 % difference in net density[1] for 10 Gy exposures at rates of 3.4 Gy/min. and 0.034 Gy/min.
Stability in Light: < 0.005 change in density per 1000 lux-day[2]
Stability in Dark (Preexposure): < 0.5 x 10^{-3} density change/day at 23°C; < 0.2 x 10^{-3} density change/day refrigerated
Uniformity, Single Sheet: < 8 % sensitometric response difference
Uniformity, Sheet-to-Sheet: < 5 % sensitometric response difference from mean
Uniformity, Batch-to-Batch: < 10 % sensitometric response difference from mean
Post Exposure Density Growth: < 12 % from 1 hr to 1 day after exposure; < 4 % 1 day to 4 days after exposure

1. Actual thickness may vary slightly from batch-to-batch in order to match sensitivity specification.
2. Cool white fluorescent light

Item #	Gafchromic®	Sheets
115-000	MD-V2-55	5

GAFCHROMIC® RTQA2 FILM

R

The GAFCHROMIC® RTQA2 self-developing radiochromic QA films are for faster, easier, more convenient, and less costly QA testing of radiotherapy sources and the commissioning of therapy equipment. Specifically designed for LINAC / accelerator machine QA such as light field / radiation field alignment tests, precision star shots; also position verification for HDR, and autoradiograpy of implantable seeds, plaques and other sources.

QUALITY ASSURANCE PLUS
- Easy to use
- Instant results
- Size the film to your exact requirement and save

GAFCHROMIC® RTQA2 is a high performance processor-less film for quality assurance exceptional accuracy with ease of use and featuring outstanding cost effectiveness. GAFCHROMIC® RTQA2 quality assurance film has been designed by leading radiochromic film scientists and provides state-of-the-art results in radiotherapy environments, while tapping all the exciting advantages of processor-less technology.

TECHNICAL BENEFITS
- Developed specifically for
  - light field alignment
  - radiation field alignment
  - precision star shots
  - position verification for HDR
  - autoradiography of implantable seeds, plaques and other sources
- Dynamic range from 0.02 Gy to 8 Gy
- Large measurement area
- Self develops in real time and requires no processing
- Near tissue-equivalent
- High spatial resolution
- Can be handled in room light
- Water resistant, water immersible (usable with water phantoms)
- Withstands temperatures up to 70°C
- Now with improved indoor lighting resistance

ECONOMIC BENEFITS
- No processor required - no darkroom
  - eliminates processing discrepancies
  - eliminates chemical waste
  - environmentally friendly
- Convenient to handle and easy to cut (cut and shape the film to your needs)
- Easily noted on with marker pen (notes easily erased if necessary)
- Economical and competitive pricing
- Available in three sizes

OUTSTANDING PERFORMANCE
GAFCHROMIC® RTQA2 radiotherapy film is an excellent, hassle-free tool for the contemporary and processor-less environment. Just position and shoot. With real-time self-developing, your results are available in seconds! No darkroom or chemicals are needed. After exposure, if the light field is not aligned with the radiation field, the discrepancy is visible immediately. Simply adjust the field accordingly and move on. In most cases, a second exposure is not required. Alignment can be achieved in an exceedingly short time. RTQA2 can even be observed through the monitor, and evaluated while it develops! Saves time and money as less film is used for each alignment, the film can be handled in room light and can be easily cut to the exact size called for. Excellent for autoradiography of implantable seeds, plaques and other sources.

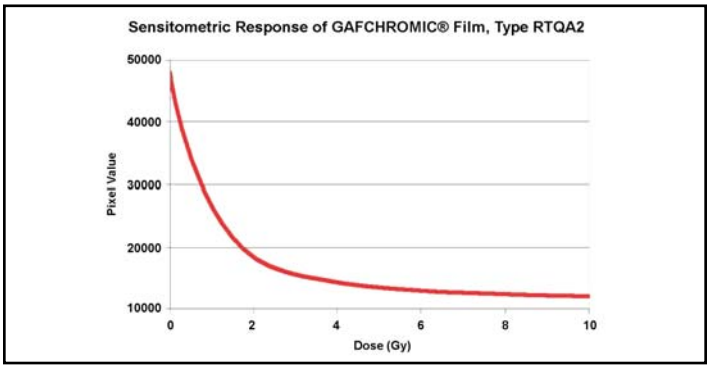
CONFIGURATION AND STRUCTURE
Gafchromic® RTQA2 is made by laminating an active layer between two polyester layers. The polyester surface makes an exceptionally robust product and allows water immersion.

PRECISION 5-LAYER LAMINATED COMPOSITION

A	yellow polyester	97 microns
B	pressure sensitive adhesive	12 microns
C	active layer	17 microns
D	surface layer	3 microns
E	white polyester	97 microns

Approximate thicknesses, actual values may vary slightly.

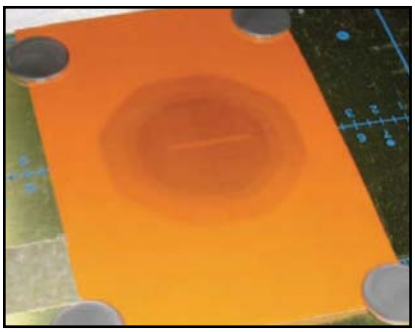
HDR APPLICATIONS
GAFCHROMIC® RTQA2-111 strips are designed for HDR positioning verification. They are designed for use within a phantom, or taped directly under a catheter. RTQA2-111 strips provide excellent results when the catheter position is marked and then the autoradiographic image is checked against the marks. Key advantages of RTQA2-111 strips are their stability and alignment. They eliminate concerns about film movement inside a ready pack and thus increase the accuracy of measurement. With dwell times between 0.5 second to 2.0 seconds (depending on the source) RTQA2-111 film strips exhibit sharp images, and clearly show source positions.

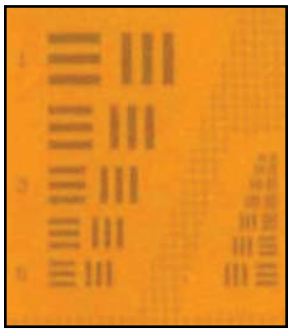


NOTE: The response of GAFCHROMIC® RTQA2 radiotherapy film is dependent upon factors specific to the facility such as the energy spectrum of the radiation source, the characteristics of the densitometer, film scanner or other means of measurement and the elapsed time between exposure and measurement etc. Therefore, the user should determine the dose-density response under the conditions pertaining to the user's facility and measurement protocol. Since the absolute response of GAFCHROMIC® RTQA2 film may vary from lot to lot, the user should re-measure response when changing to a new lot number.

Item #	Gafchromic®	Application	Size	Sheets	Minimum Order
115-020	RTQA2-1010	Light field alignment test	10" x 10" (25.4 x 25.4 cm)	25	1
115-022	RTQA2-1010P	Pre-scaled Film	10" x 10" (25.4 x 25.4 cm)	25	1
115-024	RTQA2-111	Brachytherapy Source Positioning	1.25" x 11" (3.2 x 27.9 cm)	25	2
115-026	RTQA2-1417	Larger light-field alignment test	14" x 17" (35.6 x 43.2 cm)	10	1

GAFCHROMIC® XR-QA2 FILM





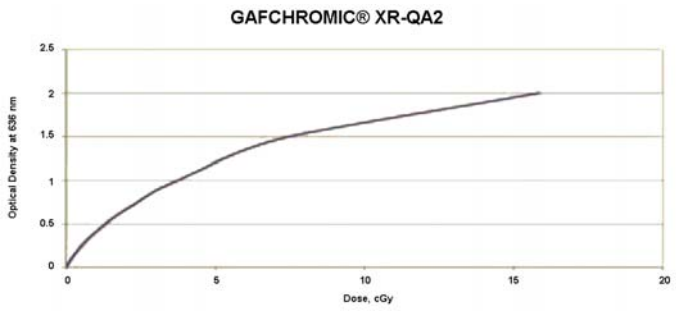
- **No processor required**
- **Sensitive to dose range 0.1 cGy to 20 cGy**
- **Instant calibration results**
- **High data integrity**
- **Cost effective, easy to use**
- **Improved contrast**
- **Can be handled in room light**

GAFCHROMIC® XR-QA2 film is designed specifically as a QA tool for radiology applications in a processor-less environment. Like all GAFCHROMIC® films, it can be cut and handled in room light. Energy range: 20 KVp to 200 KVp.

STRUCTURE

A	yellow polyester	97 microns
B	pressure sensitive adhesive	15 microns
C	active layer	25 microns
D	surface layer	3 microns
E	white polyester	97 microns

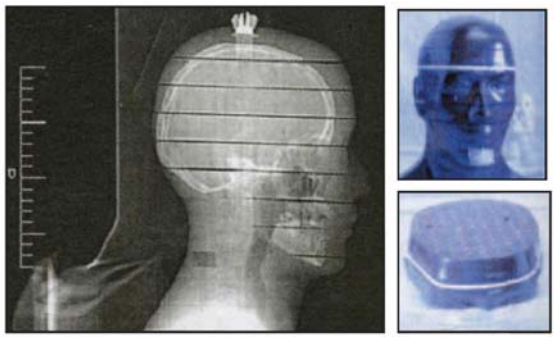
Actual film layer thicknesses may vary slightly

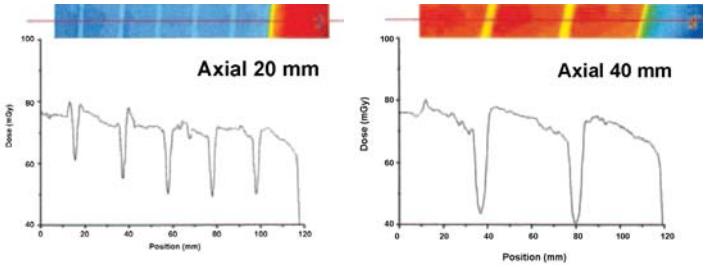


Sensitometric Response of GAFCHROMIC® XR-QA2 Film

Imaging detail with high resolution and contrast State-of-the-art quality production techniques for XR-QA2 assure consistent and reliable high contrast results, with imaging detail at greater than 5000 dpi. Results are easy to read; and data is easy to understand.

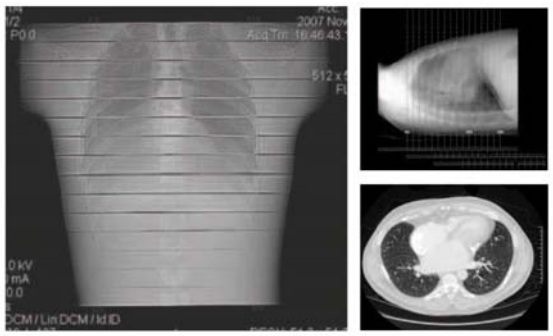
HEAD PHANTOM DOSIMETRY APPLICATION

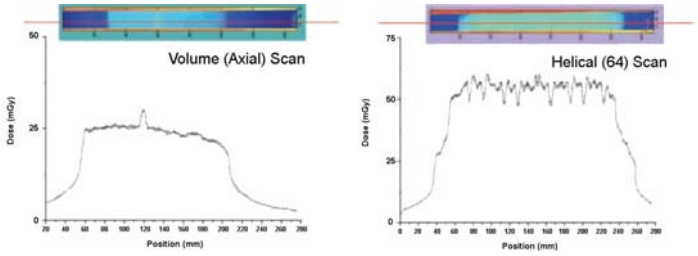




Typical head phantom radiation analysis XR-QA2 film is easy to use, cost effective, and compatible with a wide variety of phantoms.

CHEST PHANTOM DOSIMETRY APPLICATION

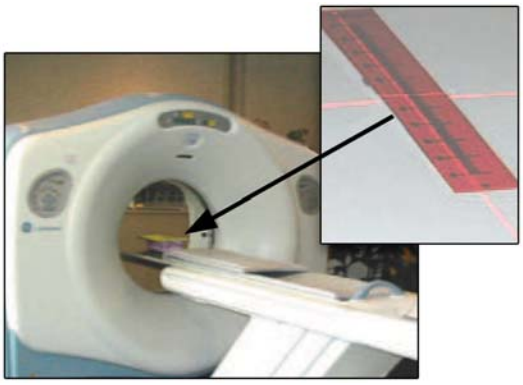


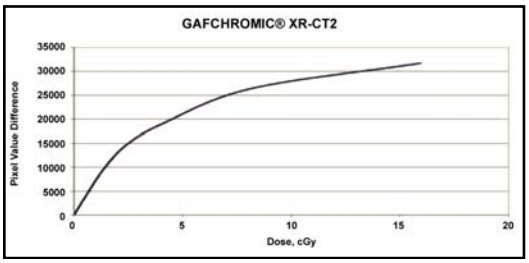


Typical chest radiation analysis, results taken from an in vivo study for a chest exam with 64 slices made with a CT scanner.

Item #	Gafchromic®	Sheets
115-034	XR-QA2, 10" x 12" (25.4 x 30.5 cm)	10
115-036	XR-QA2-810, 8" x 10" (20.3 x 25.4 cm)	10

GAFCHROMIC® XR-CT2 FILM





Sensitometric Response of GAFCHROMIC® XR-CT2 Film

- **Excellent for CT QA**
- **Sensitive to dose range 0.1 cGy to 20 cGy**
- **High data integrity**
- **Instant calibration results**
- **Self-developing in real time**
- **Easy to use**
- **Improved contrast**
- **Cost effective**

The GAFCHROMIC® XR-CT2 film is for measuring radiation beam slice width and beam position alignment on CT scanners. It has high accuracy and superior data integrity, and self-develops. A printed scale helps determine positions of light and radiation field, and beam slice width, with a single exposure.

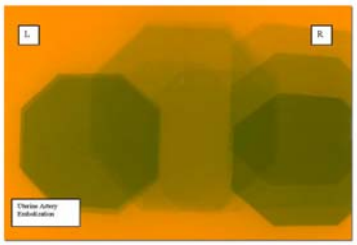
Specifications

Energy Range: 20 KVp to 200 KVp
Size: 0.75" x 5" (1.9 x 12.75 cm)
Quantity: 50 strips per package

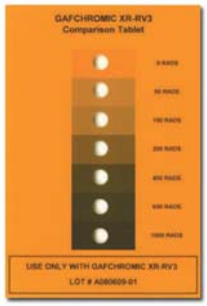
Item #	Gafchromic®	Strips
115-032	XR-CT2	50

GAFCHROMIC® XR-RV3 FILM

For Peak Skin Dose Measurement



An exposed film with patient's orientation with respect to the film



115-031 Comparator Strip

- **An excellent tool for the processor-less environment**
- **Sensitive to wide dose range 0.01 Gy to 30 Gy**
- **An easy to use film with high data integrity**
- **Improved resistance to indoor lighting**
- **Shelf life: 18 month at room ambient temperature**

The GAFCHROMIC® XR-RV3 film is designed for surface peak skin dose measurement in interventional procedures guided by fluoroscopy. .A comparator strip is also available for quick visual estimation of dose at a point, requiring no digitizing. Energy range: 30 keV to 30 MeV.

Structure of GAFCHROMIC® film, type XR-RV3

A yellow polyester . . . . . 97 microns
B pressure sensitive adhesive . . . . . 12 microns
C active layer . . . . . 17 microns
D surface layer . . . . . 3 microns
E white polyester . . . . . 97 microns

Specifications

Configuration: 3-layer laminate (substrate - active layer - substrate)
Substrate: White and yellow polyester

Item #	Gafchromic®	Sheets
115-030	XR-RV3, 14" x 17" (35.6 x 43.2 cm)	25
115-031	Comparator Strip for XR-RV3 Film	