

Daily ISO Phantom

Model 023



USER GUIDE

CIRS

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OVERVIEW

Accurate radiation dose delivery requires daily checks of the alignment between the true radiation isocenter and the isocenters of the imaging, localization and targeting systems. The CIRS Daily ISO Phantom provides a cost-effective, quick, and accurate means for testing isocenter coincidence.

Using the Daily ISO Phantom, LINAC lasers and light field can be “tuned” to the true radiation isocenter using the engraved markings on the phantom's exterior. The light field and radiation field alignment can be checked using integrated radiographic markers. More importantly, the isocenters of both the ODI and the EPID can be checked for true spatial alignment and coincidence with that of the treatment beam.

DESCRIPTION OF THE PHANTOM

The Daily ISO phantom contains two four ceramic balls 6.35mm (1/4") in diameter: one central marker and one offset marker.

The central marker, combined with the concentric circles machined on the anterior, posterior, left and right faces of the phantom, is used to determine the isocenters of the linac collimator, gantry, radiation field, couch, and OBI/CBCT. CIRS' ISO Analyze™ Software may be used to automate these measurements.

The offset target, marked by bull's eye targets on the outside faces of the cube, is used to ensure that the table offset coordinates derived from kV/MV imaging and matching to digitally reconstructed radiography (DRR) are accurate. This measurement is performed by locating the offset target, moving the table the determined amounts and verifying that the offset target has been positioned at the isocenter.

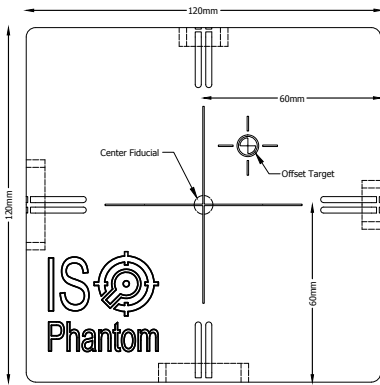
The two ceramic markers placed along the linac Y axis are used to check the image magnification and to compute the linac isocenters. This measurement is performed using third-party software.

The phantom also contains an internal \varnothing 1.27 cm (1/2") dumbbell, which is made of aluminum to provide high imaging contrast. It is designed to verify automatic image matching performed by various software packages. Its shape and position provide images that eliminate any errors induced by symmetry.

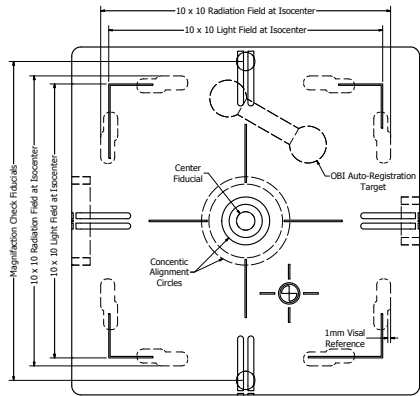
The phantom also contains engravings on the faces to minimize setup errors by aiding in phantom alignment to the linac cross-hair/light field and laser laser lights. These engravings include cross-hairs on four faces of the Daily ISO Phantom and light field corners on three faces (left, anterior and right).

SPECIFICATIONS

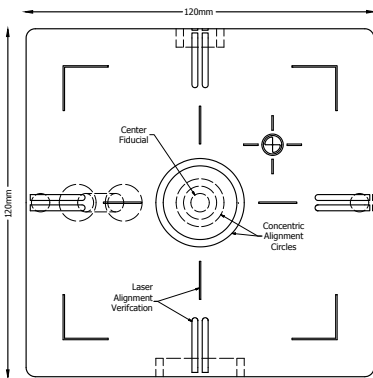
<p>PHANTOM BODY</p>	<p>Dimensions: 12 cm x 12 cm x 12 cm Weight: 1.7 kg Material: Plastic Water®</p>
<p>FIDUCIALS</p>	<p>Qty: Four (1) Center Fiducial (1) Offset Target (2) Magnification Check Fiducials Material: Ceramic Diameter: 6.35 mm</p>
<p>OBI AUTO-REGISTRATION TARGET</p>	<p>Qty: One Material: Aluminum</p>



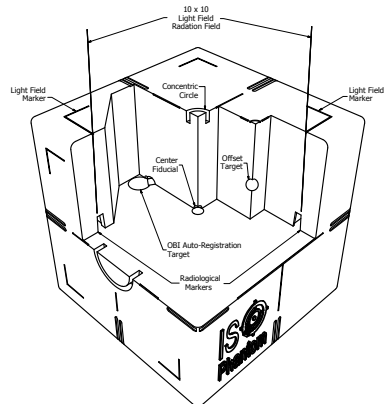
Inferior / Superior View



Anterior / Posterior View



Lateral View



Interior View

GENERAL PROCEDURE

1. Establish baseline/reference CT scan of the ISO phantom. Insure that the Daily ISO Phantom is level and square before scanning.
2. Export to TPS and establish as a “Phantom Plan”. The phantom plan can use the central fiducial as the isocenter for the kV/MV-2D/2D match and the offset target fiducial as the isocenter for the CBCT.
3. Place the Daily ISO Phantom on treatment couch and align to room lasers.
4. With gantry positioned AP, set MLC/jaws to 10cm by 10cm and verify light field coincidence relative to engraved markings on top surface of the phantom. Record ODI value to top of the phantom. (See Figure 1 & 2)

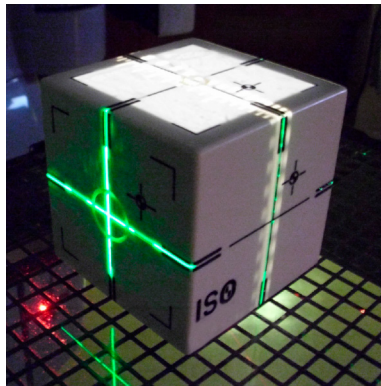


Figure 1.

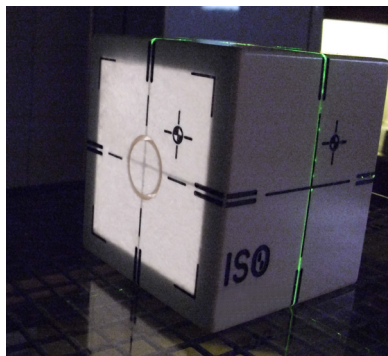


Figure 2.

- Expose 10 by 10 field and check light field/radiation field coincidence using internal radiological markers.
- Image the Daily ISO Phantom using both MV and kV modalities and conduct a kV/MV-2D/2D match.

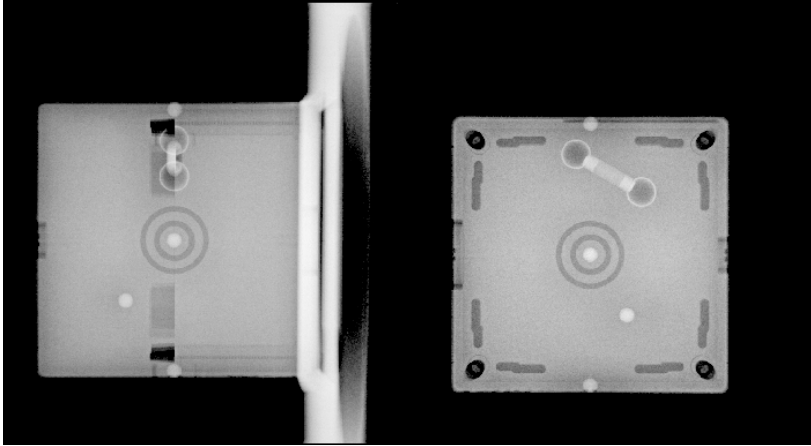


Figure 4. Concentric circles verify accurate alignment of the Daily ISO phantom and establish true position of the kV radiation isocenter

UROC, DAILYIMAGING ID: PHYS0025

KVAP:kEV - kV AP Center

2D / 2D Match

KV Imager Position (VAR_IEC Scale)				KV Exposure			
	TARGET	ACTUAL		TARGET	ACTUAL		
Gantry Rtn	180.0	180.0	Blade X1		+13.3	Anatomy	None
Source Rtn	90.0	90.0	Blade X2		+13.3	Size	
SAD	900.0	900.0	Blade Y1		+10.0	kV	75.0
kV Imager Vrt	50.0	50.0	Blade Y2		+10.0	mA	50.0
kV Imager Lat	0.0	0.0				mAs	1.60
kV Imager Lng	0.0	0.0				ms	32.0

5 Minute Timer: 0.00 [Reset]

Anode: 0.0 % HU
Housing: 1.0 % HU

1. Acquire 2. Analyze Cancel

Figure 3. 2D/2D match of kV and DRR

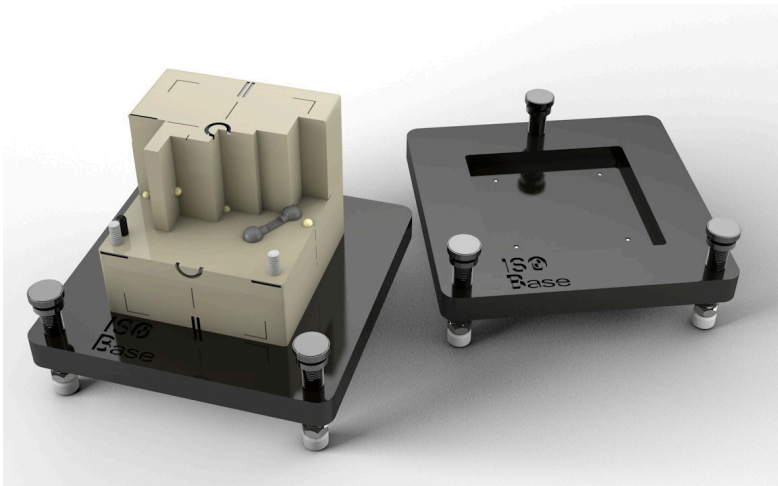
7. Determine location of the offset fiducial. Compare these values to your preset acceptance limits.
8. Using the offset coordinates, conduct a couch shift.
9. Image the phantom with CBCT, locate the central fiducial and determine new couch offsets. Compare these values to your preset acceptance limits.
10. Using the offset coordinates, implement a couch shift.
11. Verify realignment to the room lasers.

NOTE: This process describes the simple day-to-day checks that the therapist can do during morning warm-up/QA. All of the daily data should be captured in the clinic's RV system for ongoing analysis by the resident physicist.

ISO BASE

(Part No. 023-04 - Purchased Separately)

The ISO Base™ contains a set of four tungsten spheres that are used by the ISO Analyze™ Software to calculate the actual pixel size for both the MV and kV image detectors. The tungsten spheres are positioned so as not to interfere with the alignment of the Daily ISO Phantom. The spheres also do not interfere with the X-ray projections of the phantom's internal and external features, which are used for alignment and isocenter calculations. The ISO Base also includes three thumb screws to assist with leveling (in a three point scheme).

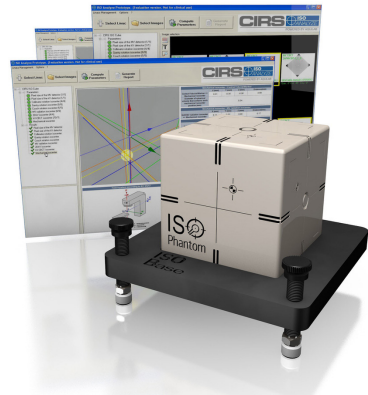


Daily ISO Phantom (left) cutaway to show internal structure and ISO Base™ (right) showing tungsten spheres.

ISO ANALYZE SOFTWARE (POWERED BY AQUILAB)

(Part No. 023-03 - Purchased Separately)

ISO Analyze integrates with the Daily ISO Phantom and ISO Base, enabling user-friendly quality control of the isocenter of a LINAC by analyzing DICOM images acquired with the EPID detector, kV detector and CBCT. Controls are run automatically, analyzing images of the phantom and quantifying a large number of evaluation parameters. The software allows users to easily generate, save and print a report for each preceding control.

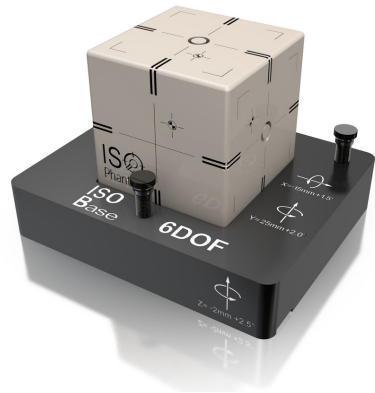


User Guide for ISO Analyze Software is provided under separate cover.

6DOF ISO BASE

(Part No. 023-08 - Purchased Separately)

The CIRS 6DOF ISO Base, Model 023-08 is an optional accessory of ISO Phantom. It is designed for positioning and leveling of ISO Phantom and quick calculation of complex 3D shifts of RT treatment systems with an integrated robotic couch.



There are two milled pockets on the CIRS 6DOF ISO Base. The ISO alignment pocket can be used to position and level the ISO Phantom on the treatment couch. It contains a set of four tungsten spheres that are used by ISO Analyze™ Software to calculate the actual pixel size for both the MV and kV image detectors.

When positioned in the shifted 6DOF pocket, internal structures of the ISO Phantom allows for the calculation of rotation and translation shifts. The shifted 6DOF pocket is machined with the mechanical limits of commercially available couches in mind, which can correct for Pitch, Roll and Yaw of ± 3 degrees of rotation. The 6DOF pocket is rotated within the IEC 61217 Coordinate System, $+1.5^\circ$ about X-axis, $+2.0^\circ$ about Y-axis and $+2.5^\circ$ about Z-axis and translated -15 mm on X-axis, +25 mm on Y-axis and -2 mm on Z-axis. The translations about the X, Y and Z-axes are applied with respect to the ISO center of ISO Phantom. Having rotational shifts smaller than the mechanical limits of the robotic couches allows the user to determine if there are errors on either side of the induced shift.

6DOF ISO BASE

(Part No. 023-08 - Purchased Separately)

Both the ISO alignment pocket and the 6DOF pocket are CNC machined in a single setup. The 6DOF ISO Base is also assembled as a single piece to minimize cumulative assembly errors.

User Guide for 6DOF ISO Base is provided under separate cover.

CARE AND HANDLING

Phantom can be cleaned with mild soap and water.
Avoid solvent based or abrasive cleaning agents.

MODEL 023 OPTIONAL ACCESSORIES

PART NO.	DESCRIPTION
023-03	ISO Analyze™ Software (Powered by AQUILAB)
023-04	ISO Base™ Alignment Platform
023-07	ISO Analyze™ Software Sister License
023-08	6DOF ISO Base

MODEL 023 PACKAGES

PART NO.	DESCRIPTION	INCLUDES
023-05	ISO Phantom Package 1	Daily ISO Phantom ISO Analyze™ Software ISO Base™ Alignment Platform
023-09	ISO Phantom Package 2	Daily ISO Phantom ISO Analyze™ Software 6DOF ISO Base

WARRANTY

All standard CIRS products and accessories are warranted by CIRS against defects in material and workmanship for a period as specified below. During the warranty period, the manufacturer will repair or, at its option, replace, at no charge, a product containing such defect provided it is returned, transportation prepaid, to the manufacturer. Products repaired in warranty will be returned transportation prepaid.

There are no warranties, expressed or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description on the face hereof. This expressed warranty excludes coverage of, and does not provide relief for, incidental or consequential damages of any kind or nature, including but not limited to loss of use, loss of sales or inconvenience. The exclusive remedy of the purchaser is limited to repair, recalibration, or replacement of the product at manufacturer's option.

This warranty does not apply if the product, as determined by the manufacturer, is defective because of normal wear, accident, misuse, or modification.

NON-WARRANTY SERVICE

If repairs or replacement not covered by this warranty are required, a repair estimate will be submitted for approval before proceeding with said repair or replacement.

RETURNS

If you are not satisfied with your purchase for any reason, please contact Customer Service or your local distributor prior to returning the product. Visit <https://www.cirsinc.com/distributors/> to find your local distributor. Call 800-617-1177, email rma@cirsinc.com, or fax an RMA request form to 757-857-0523. CIRS staff will attempt to remedy the issue via phone or email as soon as possible. If unable to correct the problem, a return material authorization (RMA) number will be issued. Non-standard or "customized" products may not be returned for refund or exchange unless such product is deemed by CIRS not to comply with documented order specifications. You must return the product to CIRS within 30 calendar days of the issuance of the RMA. All returns should be packed in the original cases and or packaging and must include any accessories, manuals and documentation that shipped with the product. The RMA number must be clearly indicated on the outside of each returned package. CIRS recommends that you use a carrier that offers shipment tracking for all returns and insure the full value of your package so that you are completely protected if the shipment is lost or damaged in transit. If you choose not to use a carrier that offers tracking or insure the product, you will be responsible for any loss or damage to the product during shipping. CIRS will not be responsible for lost or damaged return shipments. Return freight and insurance is to be pre-paid.

WITH RMA NUMBER, ITEMS MAY BE RETURNED TO:

CIRS
Receiving
900 Asbury Ave,
Norfolk, Virginia, 23513 USA

PRODUCT	WARRANTY PERIOD
Model 023 - Daily ISO Phantom	60 Months

CIRS

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