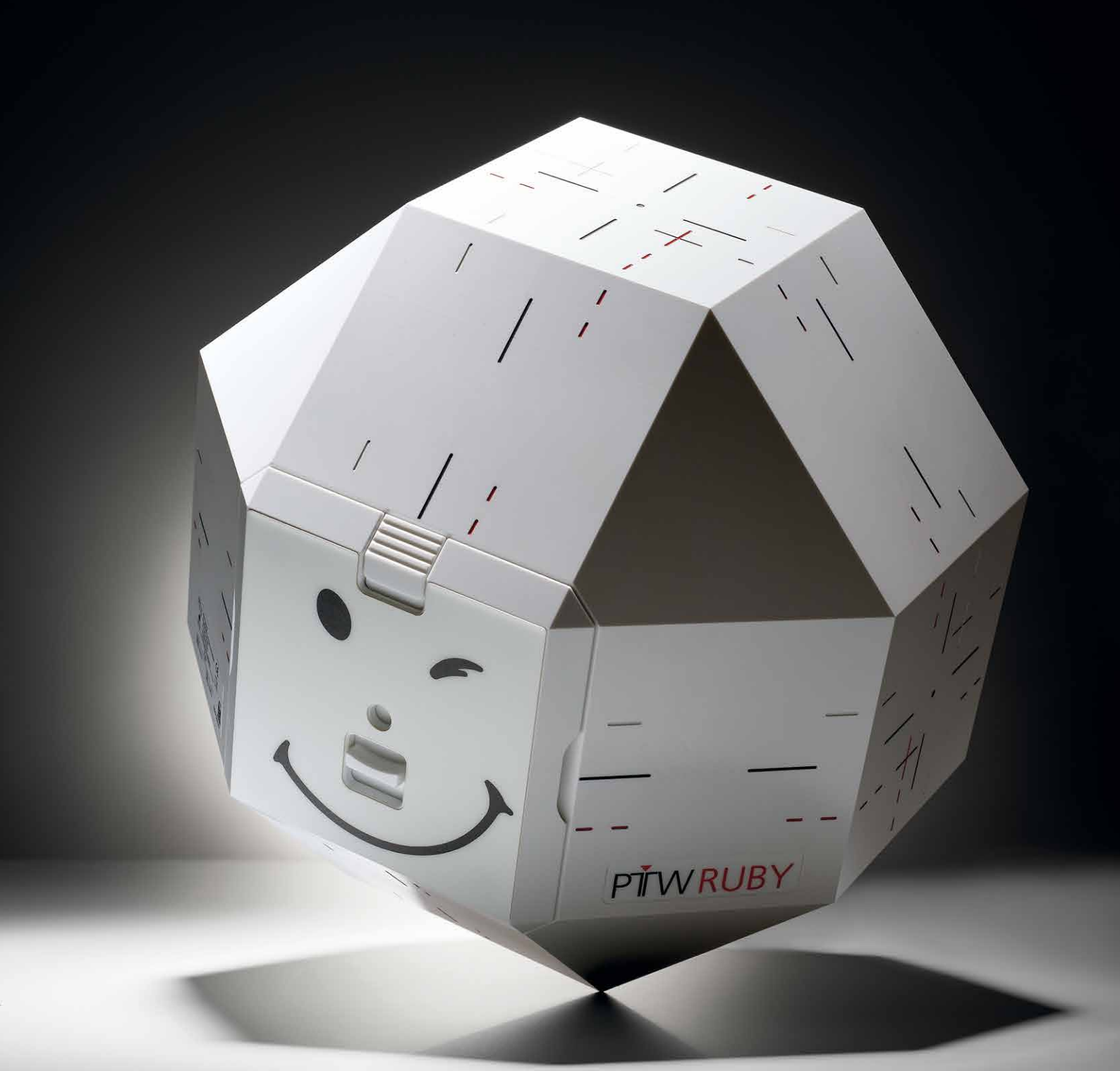


RUBY
The Modular QA Phantom

System QA · Linac QA · Patient QA

PTW THE DOSIMETRY COMPANY

RUBY

As Flexible As Your Needs.
The Modular Phantom Platform for
High-Precision Radiotherapy and SRS/SBRT QA

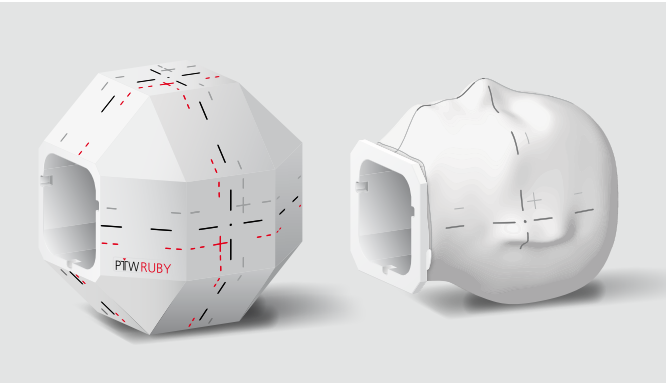
With its unique modular phantom design and variety of application-specific inserts, RUBY combines versatility with unrivaled flexibility in radiotherapy QA.

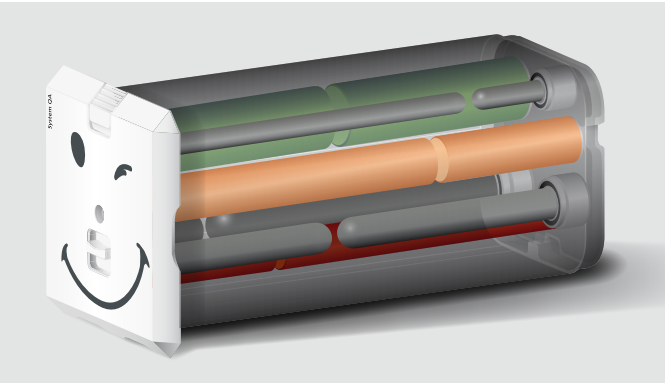
Perform integrated tests of the entire treatment chain with one basic phantom by adding and expanding QA capabilities as and when you need them.

System Overview

- Modular phantom platform with powerful, ready-to-use application-specific inserts
- Comprehensive end-to-end testing of the entire process with one single insert
- Systematic QA of multiple metastases treatments with one isocenter
- Alignment checks of the entire system, including 6D couches and SGRT systems
- CT markers in phantom and all inserts for enhanced visibility
- Integrated, compatible solution – phantom, inserts, detectors from one single source

RUBY is a modular phantom platform for radiotherapy QA. With its unique modular phantom design and variety of application-specific inserts, RUBY combines versatility with unrivaled flexibility. It allows integrated tests of the entire treatment chain with one basic phantom by adding and expanding QA capabilities as and when needed.
RUBY is compatible with Semiflex, Semiflex 3D, PinPoint 3D, microSilicon and microDiamond detectors, as well as with the Medscint Detector System. Special stereotactic radiation procedures are performed with couch extensions equipped with head shells and for this type of application, the RUBY system can be combined with the RUBY head phantom. The RUBY head phantom is compatible with all inserts.





RUBY base phantom and RUBY head phantom

Specification

RUBY Base Phantom	
Design:	Polyhedron phantom with octahedral symmetry (10 cm side length) and cubic hole for QA test inserts in phantom center
Laser Alignment	
Marks:	Black: phantom center Gray: translational shift - coronal: 18 mm - transversal: 14 mm - sagittal: -25 mm Red: translational and rotational shift - coronal: -12 mm, rotation -1° - transversal: -10 mm, rotation 2.5° - sagittal: 15 mm, rotation -1.5°
Material:	Polystyrene
Density:	1.05 g/cm^3
Dimensions:	241.4 mm x 231.4 mm x 241.4 mm (W x D x H)
Weight:	6.7 kg
Part No.:	T40072.1.001

RUBY Head Phantom	
Design:	Head-shaped phantom with cubic hole for QA test inserts
Laser Alignment	
Marks:	Black: phantom center Gray: translational shift - coronal: 18 mm - transversal: 14 mm - sagittal: -25 mm
Material:	Polystyrene
Density:	1.05 g/cm^3
Dimensions:	181 mm x 231.4 mm x 229.4 mm (W x D x H)
Weight:	3 kg
Part No.:	T40072.1.800

System QA set L981636 with RUBY base phantom

Comprehensive end-to-end testing of the entire process with the RUBY System QA insert

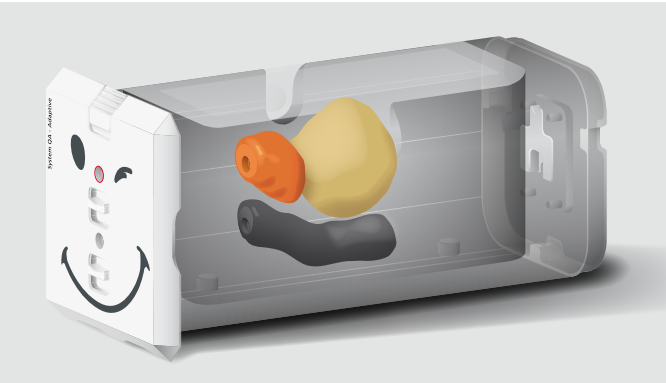
- ICRU-based tissue-equivalent materials (brain, lung and bone) for electron density check, TPS contouring QA and enhanced visibility in kV, CBCT and MV images
- MRI visible cavities enable check of CT/MRI registration and qualitative MRI distortion check
- Detector positioning at the center of the insert marked with CT markers made of bone equivalent material

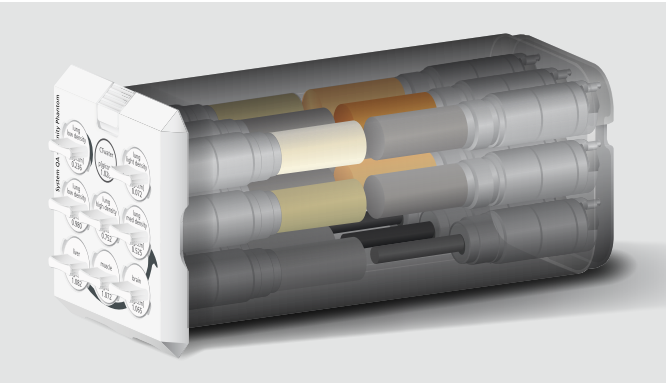
Systematic QA of multiple metastases treatments with one isocenter with RUBY System QA MultiMet insert

- Enables positioning of three detectors at different positions within the insert marked with CT markers made of bone equivalent material
- Contains three cylinders made of bone equivalent material for enhanced visibility in kV, CBCT and MV images
- Enables systematic QA of multi metastases treatments, e.g. Varian HyperArc™

Specification

RUBY Insert "End-to-End Test" for System QA	
Design:	Cubic insert with automatic locking mechanism, containing three cylindrical CT markers, three CT cavities, three MRI cavities and a detector bore-hole in the center. Detector holders optionally available for: Semiflex ionization chamber (31010), Semiflex 3D ionization chamber (31021), PinPoint® 3D ionization chamber (31022), microSilicon (60023), microDiamond® (60019)
Cavities:	Three cavities with MRI-visible material: Ø 25 mm, Ø 15 mm und Ø 10 mm Three cavities with tissue-equivalent, CT-visible material: lung, brain and bone (according to ICRU-44/-46 standards)
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.4 kg
Part No.:	T40072.1.300





System QA - adaptive set L981670 with RUBY base phantom

End-to-end QA for adaptive radiotherapy

- Two different organ sets consisting of bladder, prostate, and rectum
- Tissue-like organs capable of measurement (compatible with Semiflex 3D ionization chamber)
- End-to-end testing of adaptive radiotherapy

Specification

RUBY Insert "Adaptive" for System QA

Design:	Cubic insert with automatic locking mechanism, recess for an organ set, three cable clamps (two in the front, one in the back)
Organ Sets:	Contain anthropomorphic structures of the bladder, prostate, and rectum, three detector boreholes for Semiflex 3D ionization chamber (31021), three CT markers each to determine the effective measurement location)
Material:	Polystyrene
Density:	1.05 g/cm^3 (bladder), 1,07 g/cm^3 (prostate/rectum)
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.45 kg (with organ set)
Part No.:	T40072.1.700, T40072.1.720 (Organ set "A"), T40072.1.730 (Organ set "B")

System QA insert - density T40072.1.600

HU/density calibration with the RUBY density insert

- Very low density lung-equivalent material for lung treatment planning available
- Four different high density metal materials for implant consideration available
- For dose measurements, an ionization chamber can be positioned instead of material
- Software supported automatic workflow for HU/density calibration (work in progress)
- Wide selection of electron density material sold separately

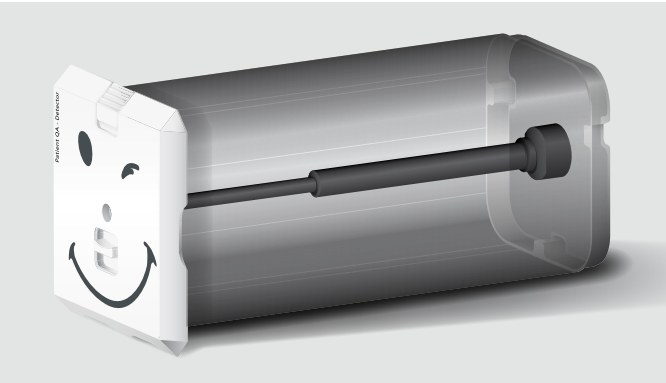
Specification

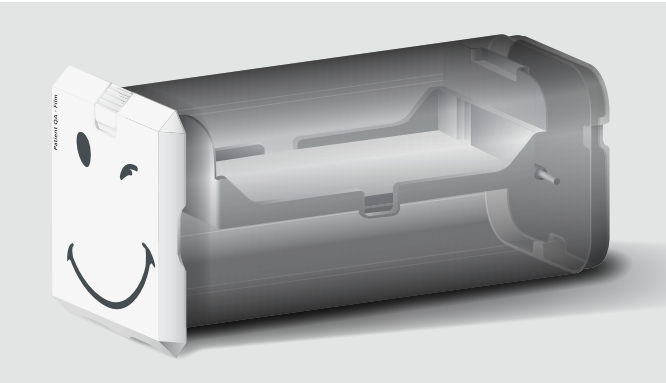
RUBY Insert "Density" for System QA

Design:	Cubic insert with automatic locking mechanism, 17 openings to accommodate the available materials, dummy plugs or a detector holder, contains fixed cylinder with material "CT water". Dummy plugs included, detector holder optionally available for Semiflex 3D ionization chamber (31021)
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.45 kg (w/o materials)
Part No.:	T40072.1.600

RUBY Electron Density Materials

Design:	Tissue-equivalent resp. metal materials encapsulated in polystyrene rods, snap mechanism for exact positioning in the insert.
Material:	see ordering information
Density:	see ordering information
Dimensions:	Ø 25 mm, length 129 mm, dimensions of encapsulated material - see ordering information
Weight:	4.8 g ... 7.8 g
Part No.:	T40072.1.6xx, indivdual numbers - see ordering information





Patient QA set L981638 with RUBY base phantom

RUBY Patient QA Detector insert for fast, accurate single-point dose measurements

- Homogenous insert with easy, fast and accurate detector positioning

Specification

RUBY Insert "Detector" for Patient QA

Design:	Homogeneous cubic insert with automatic locking mechanism, containing three cylindrical CT markers and a detector borehole in the center. Dummy plug for CT scans included. Detector holders optionally available for: Semiflex ionization chamber (31010), Semiflex 3D ionization chamber (31021), PinPoint® 3D ionization chamber (31022), microSilicon diode (60023), microDiamond® (60019)
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.5 kg
Part No.:	T40072.1.100

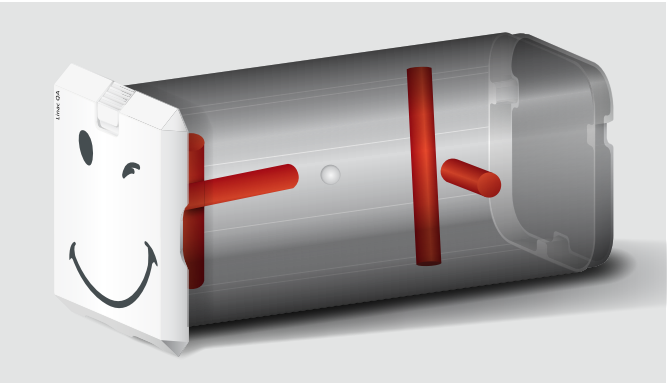
RUBY Patient QA Film insert for precise radiochromic film measurement

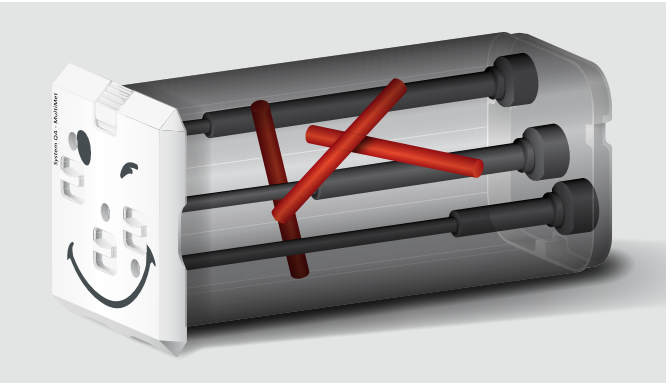
- Homogenous insert for film positioning of radiochromic film

Specification

RUBY Insert "Film" for Patient QA

Design:	Homogeneous cubic insert for radiochromic films with automatic locking mechanism and three cylindrical CT markers. Plastic needle for film perforation included.
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.5 kg
Part No.:	T40072.1.400





Linac QA set L981637 with RUBY base phantom
Daily checks of IGRT positioning accuracy, including 6D couches and SGRT systems with RUBY linac QA insert

- Tissue-equivalent bone structures for enhanced visibility in kV, CBCT and MV images
- High-density radiopaque sphere at isocenter for easy Winston-Lutz testing (Automated analysis of MV images with optional IsoCheck epid software)
- Clearly visible markings for defined translational and rotational displacement

Specification

RUBY Insert "Alignment/Isocenter Check" for Linac QA

Design:	Homogeneous cubic insert with automatic locking mechanism, containing three cylindrical CT markers, a high-density Ø 8 mm sphere in the center, four tissue-equivalent Ø 12 mm bone rods in the volume
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.5 kg
Part No.:	T40072.1.200

RUBY Tilting Base for Linac QA

Design:	Base plate with red laser alignment marks for correct setup of RUBY phantom. Requires RUBY insert for "LINAC QA".
Material:	Polystyrene
Density:	1.05 g/m^3
Dimensions:	130 mm x 130 mm x 20 mm (W x D x H)
Weight:	0.25 kg
Part No.:	T40072.1.030

RUBY set MultiMet L981654 with RUBY head phantom
Set for comprehensive testing of multiple metastases treatments with one isocenter and use of head shells

RUBY head phantom

- Homogenous head shaped phantom with marking for translational displacement; compatible with patient mask systems

Systematic QA of multiple metastases treatments with one isocenter with RUBY System QA MultiMet insert

- Enables positioning of three detectors at different positions within the insert marked with CT markers made of bone equivalent material
- Contains three cylinders made of bone equivalent material for enhanced visibility in kV, CBCT and MV images
- Enables systematic QA of multi metastases treatments, e.g. Varian HyperArc™

Specification

RUBY Insert MultiMet for System QA

Design:	Cubic insert with automatic locking mechanism, containing nine cylindrical CT markers, three cavities and three detector boreholes. Detector holders optionally available for: Semiflex ionization chamber (31010), Semiflex 3D ionization chamber (31021), PinPoint® 3D ionization chamber (31022), microSilicon (60023), microDiamond® (60019)
Cavities:	Three cavities with CT-visible, bone-equivalent, material according to ICRU-44/-46 standards, Ø 8,5 mm, length 93 mm
Material:	Polystyrene
Dimensions:	118 mm x 241.4 mm x 118 mm (W x D x H)
Weight:	2.5 kg
Part No.:	T40072.1.500

Ordering Information

RUBY Sets

L981636 RUBY set System QA
L981670 RUBY set System QA - adaptive
L981637 RUBY set Linac QA
L981638 RUBY set Patient QA
L981654 RUBY head phantom set MultiMet

Individual Ordering

T40072.1.001 RUBY base phantom
T40072.1.800 RUBY head phantom
T40072.1.100 RUBY insert Patient QA - detector
T40072.1.200 RUBY insert Linac QA
T40072.1.300 RUBY insert System QA
T40072.1.400 RUBY insert Patient QA - film
T40072.1.500 RUBY insert System QA - MultiMet
T40072.1.600 RUBY insert System QA - density phantom
T40072.1.700 RUBY insert System QA - adaptive
T40072.1.030 RUBY tilted base

Single detector holders upon request

Material Sets

L981671 RUBY ED material set - small
L981672 RUBY ED material set - medium
L981673 RUBY ED material set - large

Individual Materials

	Physical Density (g/cm^3)	Electron Density Relative to Water	Dimensions of Material
T40072.1.616 RUBY ED material lung light density	0.078	0.076	diameter 20 mm, length 45 mm
T40072.1.620 RUBY ED material lung low density	0.236	0.227	diameter 20 mm, length 45 mm
T40072.1.622 RUBY ED material lung med density	0.525	0.515	diameter 20 mm, length 45 mm
T40072.1.624 RUBY ED material lung high density	0.752	0.735	diameter 20 mm, length 45 mm
T40072.1.626 RUBY ED material adipose	0.980	0.960	diameter 20 mm, length 45 mm
T40072.1.654 RUBY ED material CT water	1.028	1.003	diameter 20 mm, length 45 mm
T40072.1.628 RUBY ED material brain	1.065	1.038	diameter 20 mm, length 45 mm
T40072.1.630 RUBY ED material muscle	1.072	1.043	diameter 20 mm, length 45 mm
T40072.1.632 RUBY ED material liver	1.082	1.053	diameter 20 mm, length 45 mm
T40072.1.634 RUBY ED material cartilage	1.113	1.083	diameter 20 mm, length 45 mm
T40072.1.636 RUBY ED material spongious bone	1.190	1.145	diameter 20 mm, length 45 mm
T40072.1.638 RUBY ED material femur	1.340	1.275	diameter 20 mm, length 45 mm
T40072.1.640 RUBY ED material humerus	1.460	1.380	diameter 20 mm, length 45 mm
T40072.1.642 RUBY ED material mandible	1.685	1.575	diameter 20 mm, length 45 mm
T40072.1.644 RUBY ED material cortical bone	1.885	1.745	diameter 20 mm, length 45 mm
T40072.1.646 RUBY ED material aluminum	2.700	2.343	diameter 8 mm, length 45 mm
T40072.1.648 RUBY ED material titanum	4.510	3.734	diameter 8 mm, length 45 mm
T40072.1.650 RUBY ED material stainless steel	8.000	6.712	diameter 8 mm, length 45 mm
T40072.1.652 RUBY ED material CoCrMo	8.300	6.853	diameter 8 mm, length 45 mm

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PTW is a global market leader for dosimetry and quality control solutions in radiation medicine, serving the needs of medical radiation experts in more than 160 countries worldwide. Starting with the famous Hammer dosemeter in 1922, the German manufacturer is the pioneer in medical radiation measurement, known for its unparalleled quality and precision.

For PTW, making medical radiation safer is both a passion and a lifetime commitment. The family-run high-tech company operates the oldest and largest accredited calibration laboratory in the field of ionizing radiation and established THE DOSIMETRY SCHOOL to globally promote the exchange of knowledge in clinical dosimetry.

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