



X-ray

for Medical Imaging

KYOTO KAGAKU's unique anthropologic phantoms for medical imaging combine our model crafting expertise with long-sought human tissue substitute breakthroughs.

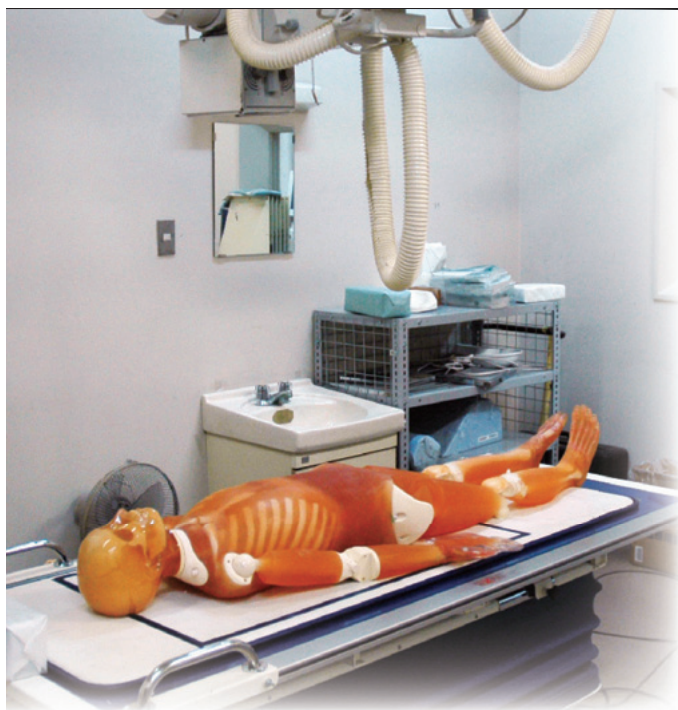
Anatomy: as an anatomical model manufacturer with long history, we know how to shape our phantoms to show three-dimensional details to meet medical professionals' high requirements.

Radiology and CT: First developed in 1967, our original phantom material has evolved into its current variation in our CT-applicable phantoms.

- PH-2** Whole Body Phantom PBU-50
- PH-2B** CT Whole Body Phantom PBU-60
- PH-4** CT Torso Phantom CTU-41
- PH-3** Angiographic CT Head Phantom ACS
- PH-5** CT Abdomen Phantom
- PH-46** CT Prostate Phantom
- PH-1** Multipurpose Chest Phantom N1 "LUNGMAN"
- PH-8** Lung Cancer Screening CT Phantom LSCT001
- PH-40** Tough Water Phantom
- PH-41** Tough Bone Phantom
- PH-42** Tough Lung Phantom
- PH-37** Therapy Body Phantom THRA-1

Whole Body Phantom PBU-50

Product No.	PH-2
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The Whole body phantom PBU-50 is a life-size, full body anthropomorphic phantom with a state-of-the-art synthetic skeleton, lungs, liver, mediastinum and kidneys embedded in KYOTOKAGAKU original soft tissue substitute.

Movable joints allow basic positioning for plain X-ray and training/research applications can be enriched by disassembling the phantom into 10 individual parts (head, limbs and trunk).

The phantom has no metal parts or liquid structures.



Frog leg position

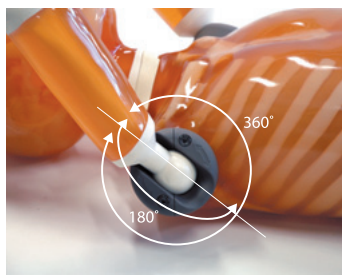


An adjustable head supporter comes with the set, facilitating various head position setting.

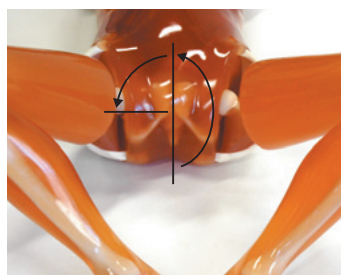


Main joints have close-to human articulation, allowing various positioning for training.

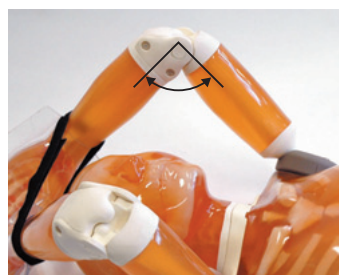
Improved shoulder joint system to take arm-up position.



Shoulders:
rotate through a full 360 degrees in the sagittal plane, approx. 180 degrees to side-ways.



Hip joints:
rotate forward up to approx. 90 degrees, then abduct up to 45 degrees each.



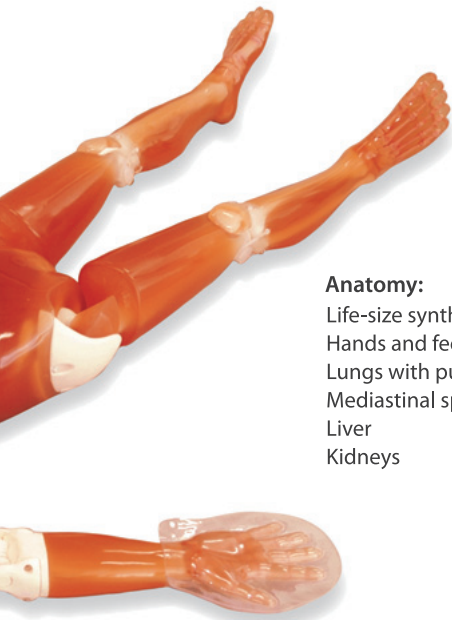
Elbows:
bend up to approx. 90 degrees.



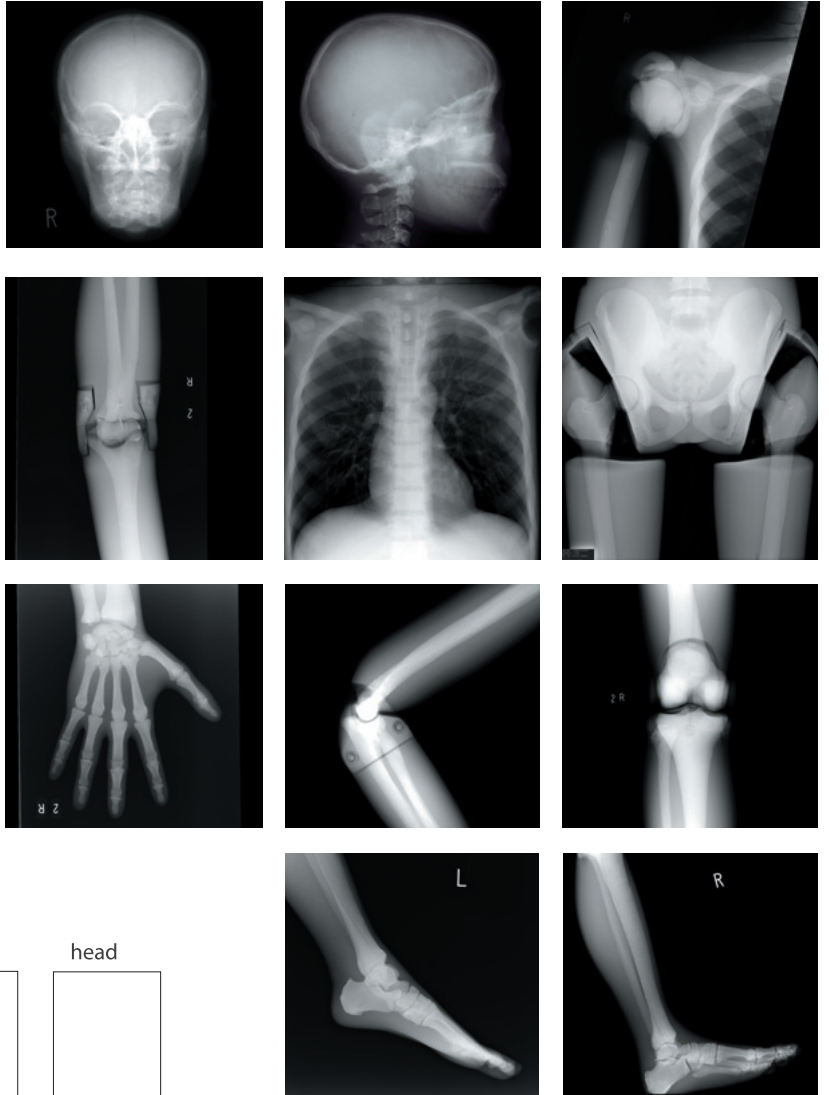
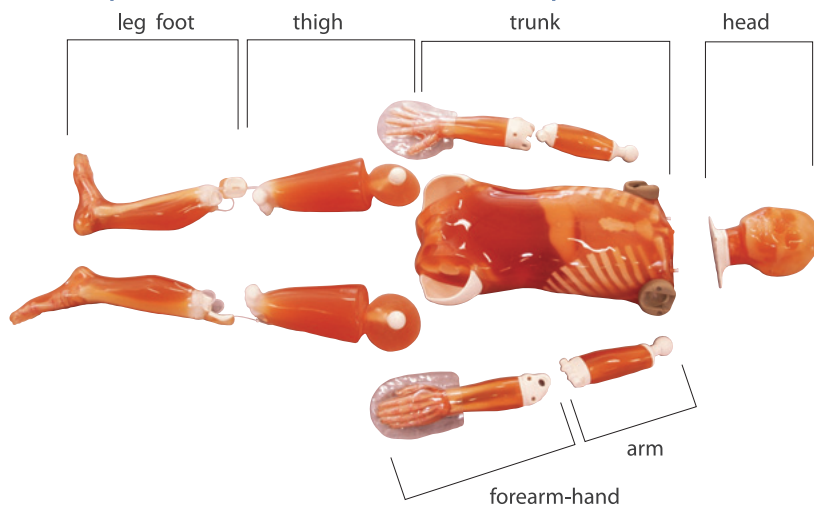
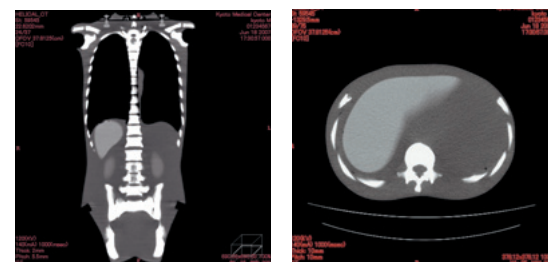
Knees:
bend up to approx. 90 degrees.

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15 Kitaneokoya-cho, Fushimi-ku, Kyoto, 612-8388, JAPAN
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www.kyotokagaku.com rw-kyoto@kyotokagaku.co.jp

**Anatomy:**

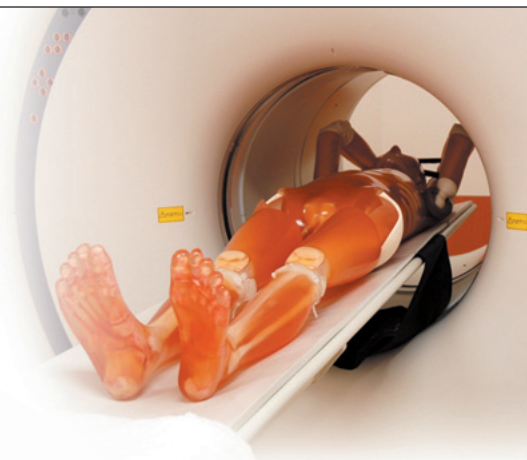
Life-size synthetic skeleton
 Hands and feet with bone trabeculae
 Lungs with pulmonary vessels
 Mediastinal space
 Liver
 Kidneys

Plain X-ray**The phantom can be disassembled into 10 parts.****CT**

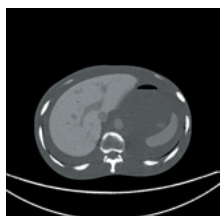
CT Whole Body Phantom PBU-60

Product No. **PH-2B**

A unique, life-size whole body phantom for CT provides a variety of educational application as well as visual evaluation in finding out optimal scanning conditions. The phantom can also be used for plain X-ray, showing life-like images. No metal parts or liquid structure are used.

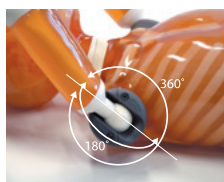


Whole Body CT



Main joints have close-to human articulation, allowing various positioning for training.

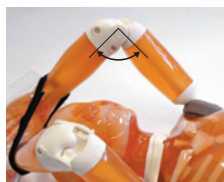
Improved shoulder joint system to take arm-up position.



Shoulders:
rotate through a full 360 degrees in the sagittal plane, approx. 180 degrees to side-ways.



Hip joints:
rotate forward up to approx. 90 degrees, then abduct up to 45 degrees each.



Elbows:
bend up to approx. 90 degrees.



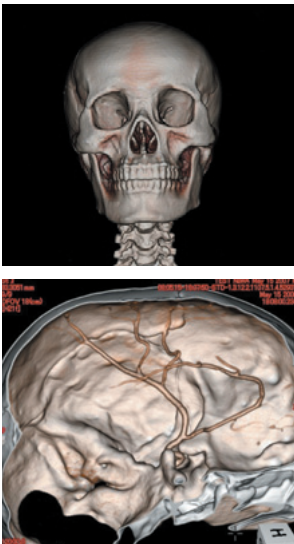
Knees:
bend up to approx. 90 degrees.



KYOTO KAGAKU

15 Kitanechoya-cho, Fushimi-ku, Kyoto,
612-8388, JAPAN
Tel: +81-75-605-2510
Fax: +81-75-605-2519
www.kyotokagaku.com
rw-kyoto@kyotokagaku.co.jp

Full internal organs for CT scanning with appropriate HU numbers.



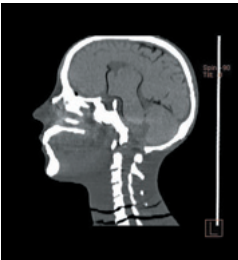
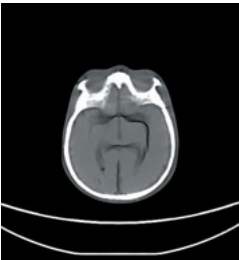
Incorporated Anatomy

Internal Organs

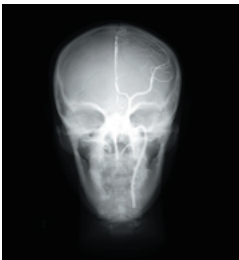
Head

- Synthetic skull
- Cervical vertebrae
- Brain
 - Cerebrum
 - Midbrain
 - Cerebellum
 - Cerebral ventricles
- Eye balls
- Arteries with contrast medium (left half only)

CT



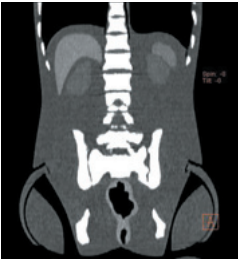
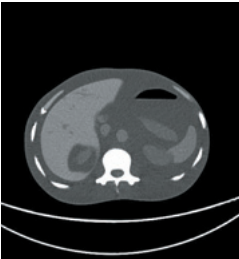
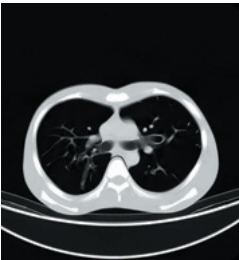
Plain X-ray



Internal Organs

Trunk

- Vertebrae
- Clavicles
- Ribs
- Sternum
- Scapula
- Coxal bones
- Femurs
- Lungs with pulmonary vessels (up to third bifurcations)
- Trachea (up to fourth bifurcations)
- Liver with portal and hepatic veins
- Pancreas
- Kidneys
- Gallbladder
- Spleen
- Aorta
- Cava
- Ureter
- Urinary bladder
- Prostate
- Rectum
- Sigmoid Colon



3D reconstruction of CT data

Materials and features:

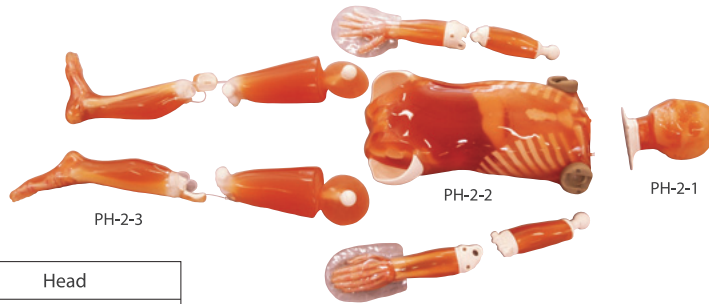
- Soft tissue and organs:
 - Urethane base resin (SZ-50)
- Synthetic bones:
 - Epoxy base resin
- Joint attachments:
 - Epoxy, urethane with carbon fiber
- Screws: Poly carbonate

Soft tissue (SZ-50) material

Material	Density g/cm3	Effective Atomic Number	Electron Density x10~23e/g	Elemental Composition (wt%)			
				H	C	N	O
Water	1.000	7.417	3.343	11.19			88.81
SZ-50	1.061	6.14	3.258	8.41	72.25	4.61	14.73

	Soft tissue	Liver	Kidneys
Hounsfield number (Approximation)	-7	70	30
Density g/cm3	1.061	1.089	1.075

Whole Body Phantom PBU-50

Product No. **PH-2**

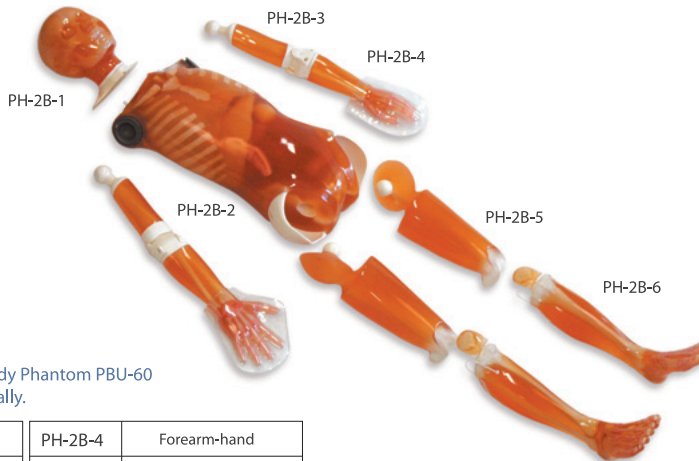
PH-2-1	Head
PH-2-2	Trunk
PH-2-3	Left Lower thigh-Foot

* other parts are the same as PBU-60

Set Includes:

1 whole body phantom PBU-60
(separable into 10 parts)
Synthetic bones,
pulmonary vessels,
mediastinal space,
liver,
kidneys are embedded
1 head supporter
1 set of replacement joint connectors and screws
(1 piece for each)
1 flat head screwdriver
1 set of sample X-ray films
phantom size: approx. 165 cm height
phantom weight: approx. 50 kg
packing size: approx. 85 x 60 x 44 cm 2-pack
packing weight: approx. 80 kg
Specifications are subject to change.

CT Whole Body Phantom PBU-60

Product No. **PH-2B**

All parts of CT Whole Body Phantom PBU-60
can be ordered individually.

PH-2B-1	Head	PH-2B-4	Forearm-hand
PH-2B-2	Trunk	PH-2B-5	Thigh
PH-2B-3	Arm	PH-2B-6	Lower thigh-Foot

Set Includes:

1 whole body phantom PBU-50
(separable into 10 parts)
Synthetic bones,
embedded organs are listed on page 4.
1 head supporter
1 set of replacement joint connectors and screws
(1 piece for each)
1 flat head screwdriver
1 set of sample X-ray films
phantom size: approx. 165 cm height
phantom weight: approx. 50 kg
packing size: approx. 85 x 60 x 44 cm 2-pack
packing weight: approx. 80 kg
Specifications are subject to change.

Optional Parts for PH-2/PH-2B

41350-000-11 Fractured Hand/Forearm Phantom

NEW

Left hand/forearm phantom with bone fractures for radiography.

Bone fractures:

ulna, radius, first metacarpal, middle phalanx of the index finger,
distal phalanx of the first finger (compressed fracture), fifth metacarpal

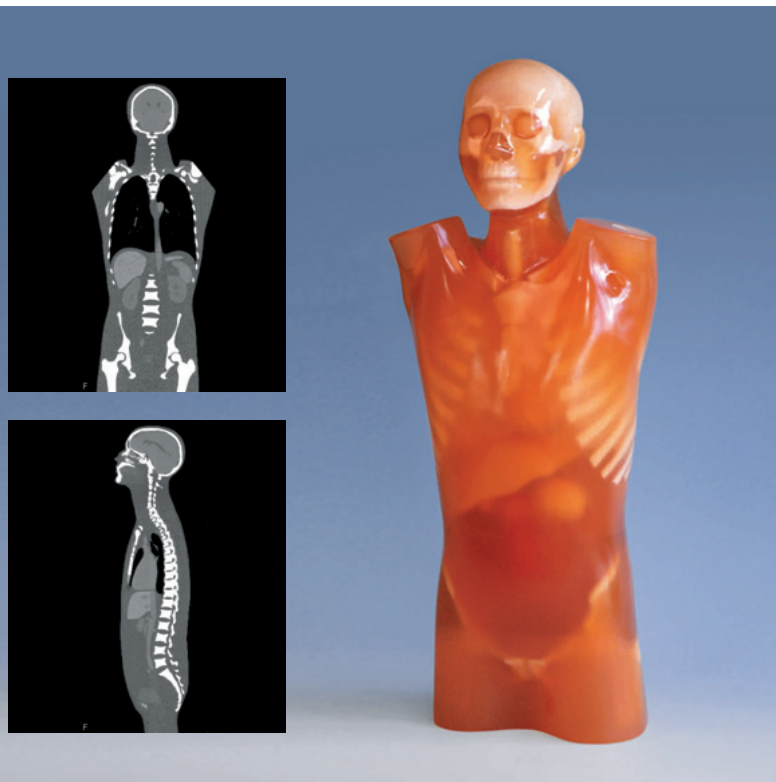
The phantom is interchangeable
with either PBU 60 or PBU50's
left hand/forearm.



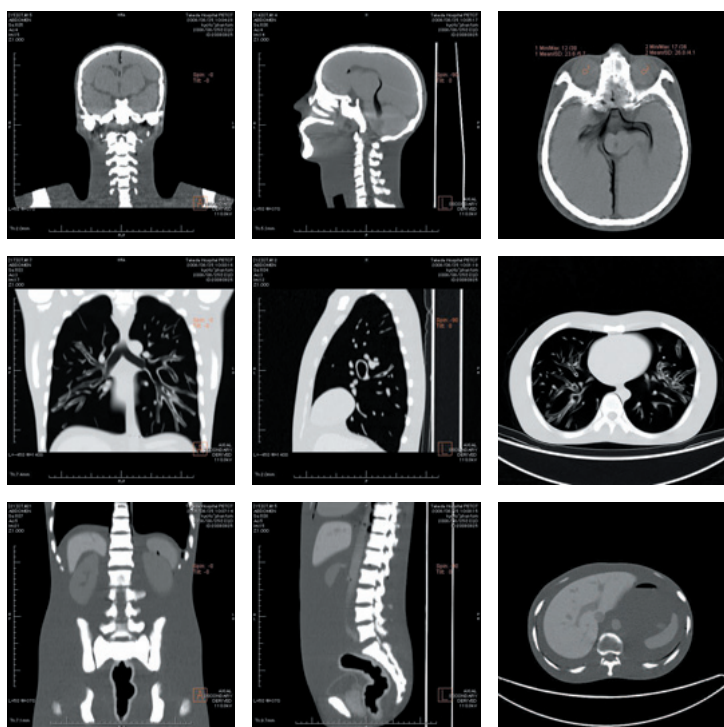
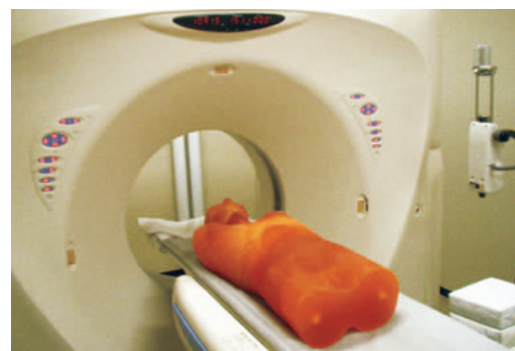
41363-010 2 carrying cases



CT Torso Phantom CTU-41

Product No. **PH-4**

A one-piece anthropomorphic torso phantom with anatomical structures allows various CT approaches including helical scanning. Along with state-of-the-art synthetic bones, brain with cerebral ventricles, eye balls, lungs with three-dimensional pulmonary vessels, trachea, liver with portal and hepatic veins, kidneys, gallbladder, pancreas, spleen, aorta, cava, ureter, urinary bladder, prostate, rectum, sigmoid colon are embedded. Each individual organ has particular Hounsfield number which corresponds that of human body. KYOTOKAGAKU original phantom materials with radiation absorption approximate to human tissue allow scanning under actual clinical setting.



Set Includes:

1 CT Torso Phantom CTU-41: life size, male

Included structures:

Synthetic bones with cartilage:
 artificial skull, vertebra, clavicles, ribs, sternum, scapula, coxal bones, femurs
 Brain with cerebral ventricles
 Eye ball, Lungs with pulmonary vessels (up to the forth bifurcations)
 Trachea (up to the third bifurcations),
 Liver with portal and hepatic veins
 Kidneys, Gallbladder, Pancreas, Spleen, Aorta, Cava, Ureter, Urinary bladder, Prostate, Rectum, Sigmoid colon, Ascites

Materials:

Soft tissue and organs: Urethane base resin (SZ-50)
 Synthetic bones: Epoxy base resin

Size:

phantom size: approx. 100 cm height
 phantom weight: approx. 45 kg
 packing size: approx. 106 x 58 x 62 cm
 packing weight: approx. 52 kg

Specifications are subject to change.

Optional Parts:

41363-030 carrying case

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15 Kitane-koya-cho, Fushimi-ku, Kyoto, 612-8388, JAPAN
 Tel: +81-75-605-2510 Fax: +81-75-605-2519
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Angiographic CT Head Phantom ACS

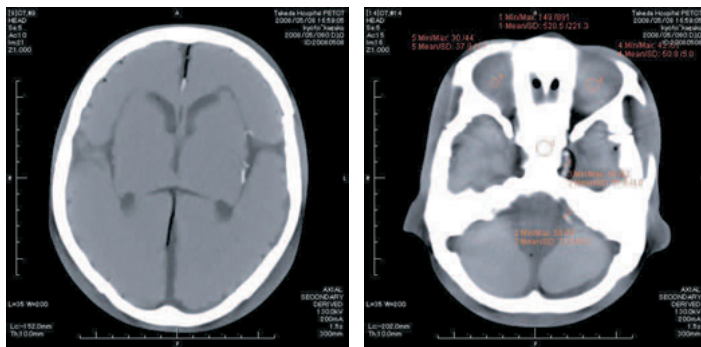
Product No. **PH-3**

The ACS head phantom is designed for image evaluation in CT angiography scanning and can be used as an educational tool for medical image interpretation. The head phantom includes a synthetic skull, cervical vertebrae (C1-C7), brain and eyeballs, along with arteries with contrast medium embedded in the left half of the head.

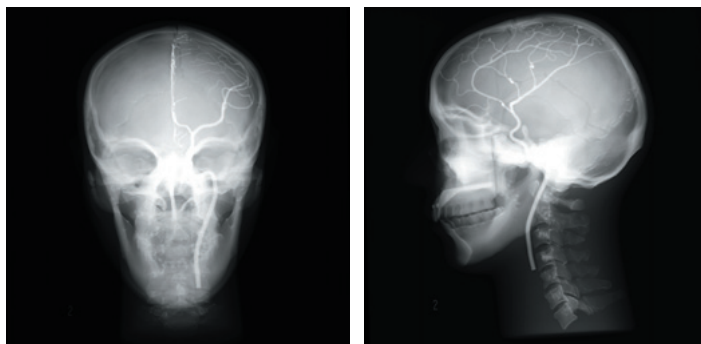
The anterior cerebral artery and middle cerebral artery are three-dimensionally disposed. Diameters of simulated arteries range from approx. 0.5 mm to 4.0 mm.

An angio type head with arteries higher contrast is also available.(41309-200)

CT

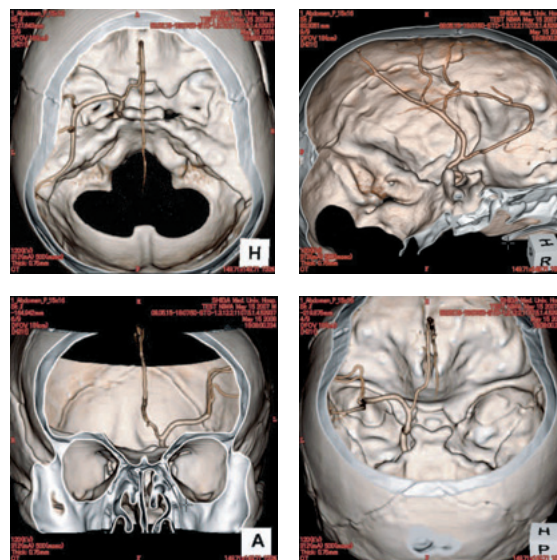


angio (angio type)



CT features:

	Soft tissue	Cerebrum	Mesencephalon	Cerebellum	Cerebral ventricles	Eye balls
Hounsfield #	0	40	40	40	40	20



3D reconstruction of CT data

Set Includes:

1 head phantom
1 carrying case
packing size: 49 x 33 x 35H cm, 9.5 kg
Specifications are subject to change.

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15 Kitanekeya-cho, Fushimi-ku, Kyoto, 612-8388, JAPAN
Tel: +81-75-605-2510 Fax: +81-75-605-2519
www.kyotokagaku.com
rw-kyoto@kyotokagaku.co.jp

CT Abdomen Phantom

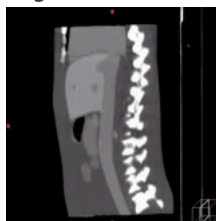
Product No. **PH-5**

This unique anthropomorphic upper abdomen phantom allows obtaining CT images approximate to clinical data.

The elaborate anatomy of organs allows a multi-dimensional approach. Liver, portal vein, bile duct, hepatic vein, hepatic artery, kidneys, pancreas, spleen and IVC are embedded along with synthetic bones. Each individual organ has a particular Hounsfield number close to human organ.



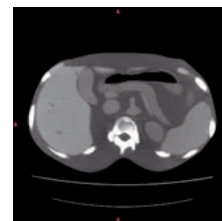
sagittal



coronal



axial



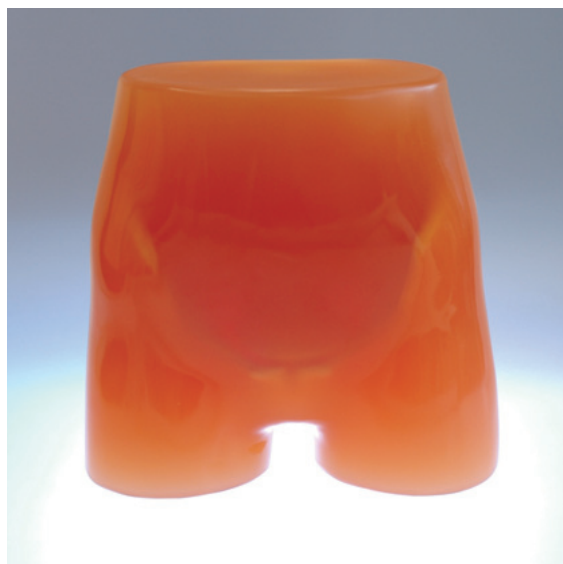
Incorporated anatomy

lungs (no internal structure), heart (no internal structure), liver, portal vein, bile duct, hepatic vein, hepatic artery, kidneys, pancreas, spleen, IVC, spinal column, ribs

Materials: Polyurethane, epoxy resin

Specifications are subject to change.

CT Prostate Phantom

Product No. **PH-46**

Incorporated anatomy

Organs: prostate, urinal bladder with simulated internal fluid, seminal vesicles and rectum.
Bones: L4, L5, pelvis and femurs (partial).

HU numbers at 80KeV

Prostate: 50

Seminal vesicles: 50

Urinal bladder: surface 30, internal fluid 0

Rectum: surface 70, simulated cavity -800 (urethane foam)

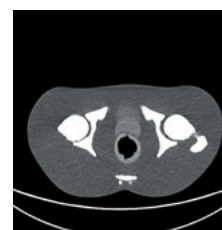
Soft tissue 40

Specifications are subject to change.



Product image

CT images



Size: approx 350 mm H



15 Kitanechoya-cho, Fushimi-ku, Kyoto, 612-8388, JAPAN

Tel: +81-75-605-2510 Fax: +81-75-605-2519

www.kyotokagaku.com

rw-kyoto@kyotokagaku.co.jp

Multipurpose Chest Phantom N1 "LUNGMAN"

Product No. **PH-1**

Production supervision:

Kiyoshi Murata, Ph.D Professor
Norihsa Nitta, Ph.D
Shiga University of Medical Science



*Optional chest plates to simulate a larger body type

Multipurpose

Applicable for both plain radiography and CT scanning.
Wide variety of uses in interpretation training, anatomical education, evaluation and assessment of devices and other research.

Accurate anatomy and high quality substitute materials

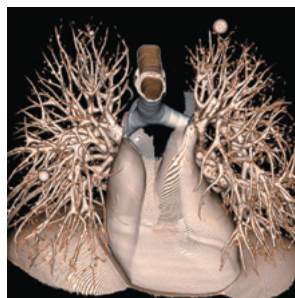
The phantom is an accurate life-size anatomical model of a human torso.
The thickness of the chest wall is based on measurement of clinical data.
The soft tissue substitute material and synthetic bones have x-ray absorption rates very close to those of human tissues.

X-ray

The phantom provides life-like radiographs very close to actual clinical images.
The three-dimensional structure allows both PA and LATERAL images to be obtained. The phantom bones and vessels show life-like contrast gradations on the image along with tube voltages.

Computed tomography

Arms-abducted position of the torso suits the CT scanning.
The pulmonary vessels are spatially traceable with CT.
Assessment of computer-aided detection systems is possible.



3D reconstruction of CT data

Multipurpose Chest Phantom N1 "LUNGMAN" PH-1



Set Includes:

- 1 male chest torso
- main body: synthetic bones are embedded
- internal parts:
 - mediastinum: heart, trachea
 - pulmonary vessels (right and left)
 - abdomen (diaphragm) block: no internal structure
- 15 simulated tumors (15 variations)
- 3 varieties of Hounsfield number: approx -800, -630, +100
- 5 sizes for each type: diameters 3, 5, 8, 10, 12 mm

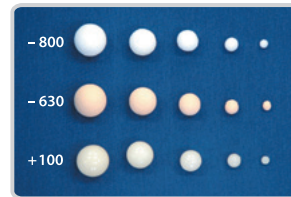
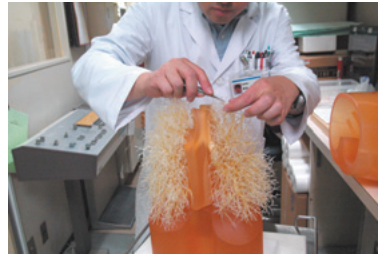
Materials:

soft tissue: polyurethane (gravity 1.06)
synthetic bones: epoxy resin
phantom size: 43 x 40 x 48H cm, chest girth 94 cm
weight: approx. 18 kg
packing size: 59 x 52 x 30 cm, 25 kg

Specifications are subject to change.

"LUNGMAN" Training

Attach the simulated tumors

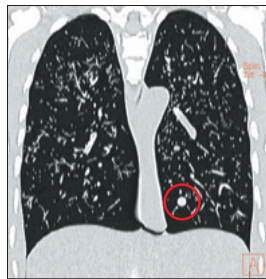


Simulated tumors in five-size and three-HU-number variations can be attached to arbitrary position in the lung field.

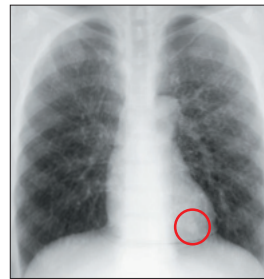
Computed tomography

CT scan training
Interpretation training
Assessment of computer-aided detection systems

CT



PLAIN X-RAY



Plain radiography

Radiograph training
Interpretation training
Assessment of tube voltages, films and other devices

Comparison



Review the plain X-ray



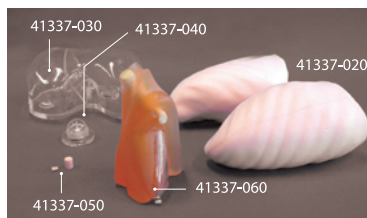
Improve interpretation skills

Comparison between Plain X-ray and CT, as well as between these images and the direct observation of the phantom, helps trainees to have three dimensional understanding and to improve X-ray interpretation skills.

Optional parts



41337-010 chest plates
41363-030 carrying case

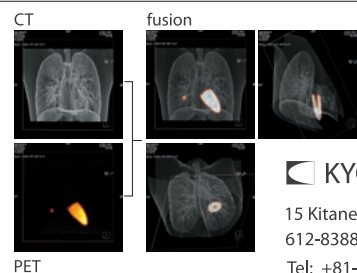


Components for Radioisotope

41337-020 Lungs of urethane
41337-030 Liver RI container
41337-040 Gallbladder RI container



41337-050 Pulmonary nodule RI container
41337-060 Mediastinum with left myocardium RI container
41337-070 Simulated tumors



PET

KYOTO KAGAKU

15 Kitanekeya-cho, Fushimi-ku, Kyoto,
612-8388, JAPAN

Tel: +81-75-605-2510

Fax: +81-75-605-2519

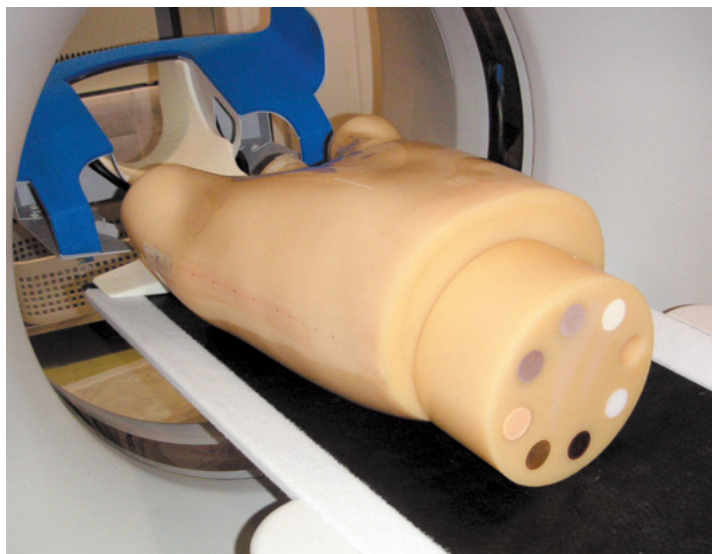
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rw-kyoto@kyotokagaku.co.jp

Lung Cancer Screening CT Phantom

LSCT 001

Product No.	PH-8
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Unique phantom dedicated for optimizing lung cancer CT screening conditions, as well as setting the standard conditions between multiple equipment or facilities for mass screening.

Original human tissue substitute material creates life-like artifact under CT scanning

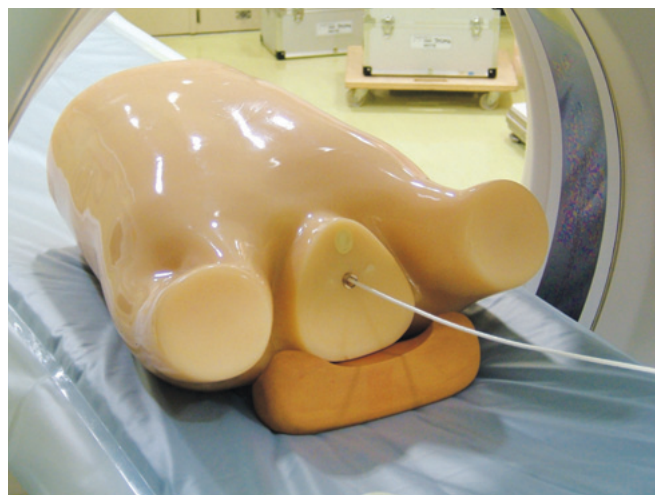
Simulated GGA type tumors are embedded on three main sections of both lungs.

Dose meter holder on the central axis of the phantom allows housing a pencil type chamber dose meter.

8-step cylindrical linearity phantom to control density curve as a scale can be attached to the chest phantom base.

LSCT 001 is a CT phantom developed to facilitate optimizing the radiation dose and other scanning conditions for Lung Cancer Screening CT examination with Helical CT or MDCT, which is aiming at early detection of lung cancers. As the screening is usually done on healthy people, the necessity of minimizing the exposure while maximizing the image quality is considered to be particularly high.

The phantom is designed to set conditions for detection of small early lung cancers such as GGA, which are difficult to be found by plain X-ray. Anthropologic structure of the phantom provides life-like images allowing operators visual evaluation, while quantitative evaluation on radiation dose and density curve of the image can be done stimulatory with a single scanning.



LSCT 001 with dose meter

Set Includes:

- Phantom includes:
- 1 Chest Phantom: life size torso with arm up position
- Internal structures:
- Bones
 - Simulated tumors on sections of three lung area
 - Apical portion of the lungs
 - Bifurcation of the trachea
 - Base of lungs
 - Dose meter hole (13 mm dia., on the central axis of the phantom)
- 1 8-step linearity phantom
 - 8 steps of 30mm dia. density samples are embedded
 - 1 adjustment base

Optional parts:

41363-040 carrying case

Sizes:

- Chest Phantom
- Measurement around the chest 93 cm
- Height 45 cm Weight approx. 18 kg
- Linearity phantom
- Diameter 200mm Height 100 mm

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rw-kyoto@kyotokagaku.co.jp



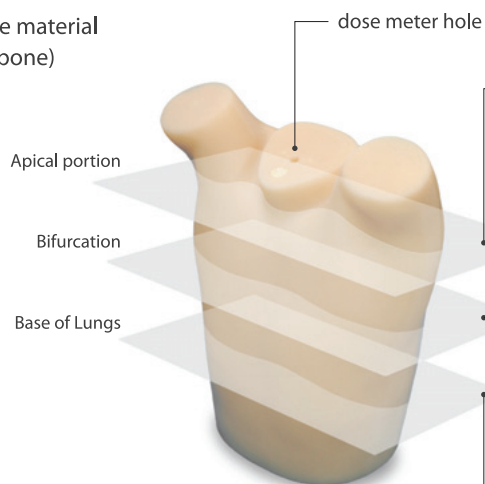
Materials and CT features

Chest phantom walls and mediastinum
Human soft tissue substitute material

Bones

Human bone substitute material
(epoxy base synthetic bone)

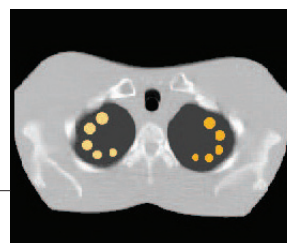
Lung background
Polystyrol foam
HU# -900



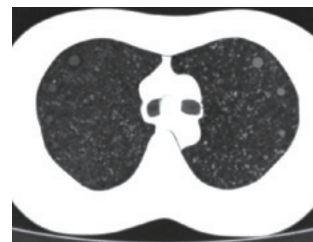
Simulated tumors

	HU contrast with the lung back ground	Size	Materials
Tumors in the right lung	Δ HU=100	4, 6, 8, 10, 12 mm dia.	Urethane resin
Tumors in the left lung	Δ HU=270	2, 4, 6, 8, 10 mm dia.	Urethane resin

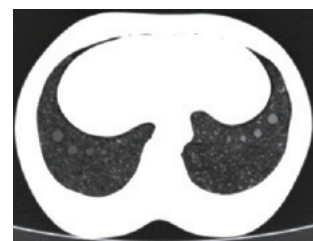
CT images



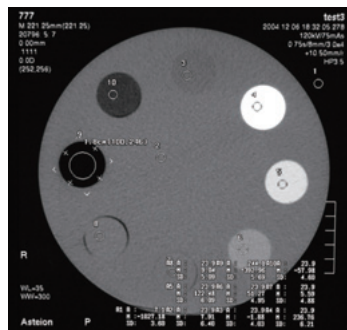
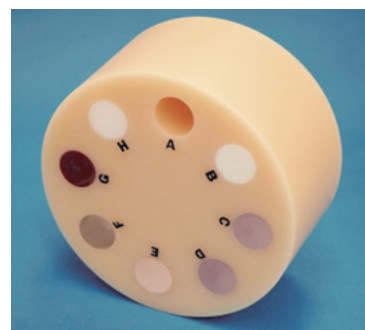
Apical portion



Bifurcation



Base of Lungs

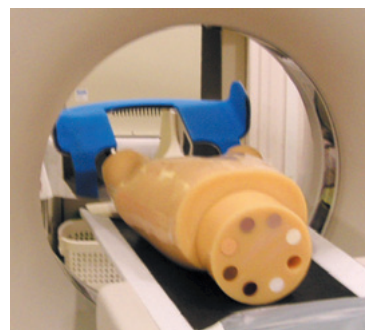


Linearity Phantom

Linearity phantom background
Urethane resin
HU# 60

Linearity phantom targets

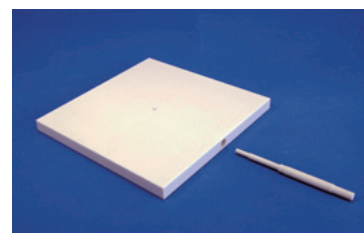
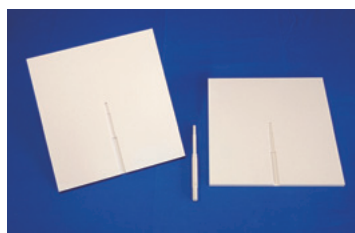
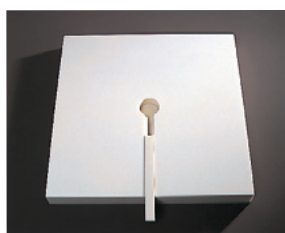
	HU#	Materials
A	-1000	Air
B	-850	Polyurethane
C	-600	Polyurethane
D	-400	Polyurethane
E	-200	Polyurethane
F	100	Polycarbonate
G	250	Bakelite
H	350	Polyacetal resin



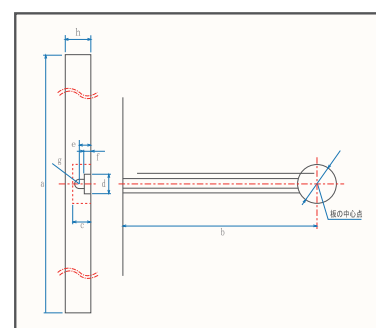
Tough Phantom Series

Product No.	PH-40 PH-41 PH-42
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Tough Phantom Series, co-developed with Japanese National Institute of Radiological Sciences, are designed for dosimetry in radiotherapy planning. Shatter proof and easy-to-work. The phantoms can also be modeled in various forms on your demand.



Chamber cavities to accommodate dosimeters can be prepared against your order.
Specify your chambers manufacturer and model number.
Let us have dimensional drawings of the chambers you are using to estimate the cost.



PH-40 Tough Water Phantom

WD-3002	300×300× 2mm	WD-3030	300×300×30mm	WD-4015	400×400×15mm
WD-3003	300×300× 3mm	WD-3040	300×300×40mm	WD-4020	400×400×20mm
WD-3005	300×300× 5mm	WD-3050	300×300×50mm	WD-4025	400×400×25mm
WD-3010	300×300×10mm	WD-4002	400×400× 2mm	WD-4030	400×400×30mm
WD-3015	300×300×15mm	WD-4003	400×400× 3mm	WD-4040	400×400×40mm
WD-3020	300×300×20mm	WD-4005	400×400× 5mm	WD-4050	400×400×50mm
WD-3025	300×300×25mm	WD-4010	400×400×10mm		



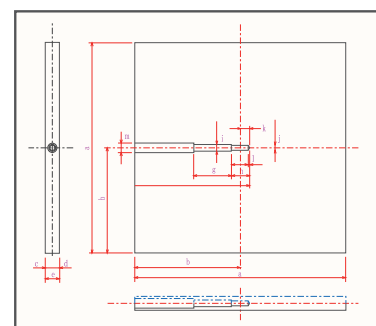
PH-41 Tough Bone Phantom

BE-T-05	Compact Bone	200×200× 5mm	BE-N-20	Inner Bone	200×200×20mm
BE-T-10	Compact Bone	200×200×10mm	BE-H-05	Cortical Bone	300×300× 5mm
BE-T-20	Compact Bone	200×200×20mm	BE-H-10	Cortical Bone	300×300×10mm
BE-H-05	Cortical Bone	200×200× 5mm	BE-H-20	Cortical Bone	300×300×20mm
BE-H-10	Cortical Bone	200×200×10mm	BE-N-05	Inner Bone	300×300× 5mm
BE-H-20	Cortical Bone	200×200×20mm	BE-N-10	Inner Bone	300×300×10mm
BE-N-05	Inner Bone	200×200× 5mm	BE-N-20	Inner Bone	300×300×20mm
BE-N-10	Inner Bone	200×200×10mm			



PH-42 Tough Lung Phantom

LP-3010	300×300×10mm
LP-3020	300×300×20mm
LP-3030	300×300×30mm
LP-3050	300×300×50mm



Comparison of Physical Properties

ICRU publication 23 (Reference man)

	Human Soft Tissue	Muscle	Fat	Cartilage	Lung
Electron Density $e^-/g(x1023)$	3.32	3.51	3.09	3.65	0.94
Effective Atomic Number	7.23	7.46	6.24	7.17	7.50
Specific Gravity ρ	1.00	1.06	0.92	1.10	0.28

	Water	Acryl.	Tough Water Phantom WD	Tough Lung Phantom LP	Tough Bone Phantom BE-T	Tough Bone Phantom BE-H	Tough Bone Phantom BE-N
Electron Density $e^-/g(x1023)$	3.34	3.25	3.25	3.26	3.11	3.15	3.21
Effective Atomic Number	7.42	6.47	7.44	7.77	13.18	11.70	9.14
Specific Gravity ρ	1.00	1.18	1.01	0.32	1.73	1.50	1.24

Characteristics

	Specific Gravity ρ	Mass energy absorption coefficient μ_{en}/ρ	Mass attenuation coefficient μ/ρ	Mass collision stopping power S/ρ	Mass scattering power $\theta^2/\rho I$	Effective Atomic Number \bar{Z}	Electron Density $e^-/g(\times 10^{23})$ ρ_e
Tough Water Phantom WD	1.017	0.046	0.032	0.026	0.118	7.444	3.252×10^{23}
Tough Lung Phantom LP	0.320	0.063	0.045	0.033	0.049	7.772	3.310×10^{23}
Tough Bone Phantom BE-T	1.730	0.004	0.003	0.008	0.020	13.179	3.108×10^{23}
Tough Bone Phantom BE-H	1.500	0.012	0.010	0.021	0.011	11.697	3.154×10^{23}
Tough Bone Phantom BE-N	1.240	0.020	0.016	0.029	0.026	9.141	3.213×10^{23}

Elemental Composition

	Tough Water Phantom WD	Tough Lung Phantom LP	Tough Bone Phantom BE-T	Tough Bone Phantom BE-H	Tough Bone Phantom BE-N
H	0.084	0.070	0.037	0.051	0.070
C	0.674	0.502	0.292	0.425	0.600
N	0.022	—	0.012	0.017	0.025
O	0.195	0.351	0.327	0.281	0.218
P	—	0.001	0.102	0.070	0.023
Al	—	0.015	—	—	—
Cl	0.002	0.010	0.001	0.001	0.001
Ca	0.023	—	0.229	0.155	0.063
Si	—	0.050	—	—	—

Therapy Body Phantom THRA-1

Product No.

PH-37



The Therapeutic Body Phantom THRA is a therapy planning phantom made of Tough Series human tissue substitutes. Sizes and spacing of dosimeter cavities and slice thickness can also be custom ordered.



THRA-1 specifications

size: approx. 900 mm high

material:

body: Tough Water WE-211
(epoxy resin)

bone: Tough Bone BE-303

lung: Tough Lung LP-430

*"TOUGH" series are Kyotokagaku original nonaqueous phantom materials.

slice thickness: 30 mm

dosimeter holes:

on each cross section, holes for glass dosimeters are located in lattice-like pattern of 30 x 30 mm. In each hole, a nylon pin is embedded.

Accessories: Supporting frame, Carrying cases

Specifications are subject to change.



Worldwide Inquiries & Ordering

Kyotokagaku Head Office and Factories:

15 Kitanechoya-cho, Fushimi-ku, Kyoto, 612-8388, JAPAN

Tel : +81-75-605-2510 Fax : +81-75-605-2519

URL: [http : // www.kyotokagaku.com](http://www.kyotokagaku.com)

E-mail : rw-kyoto@kyotokagaku.co.jp

Kyotokagaku USA Office: USA and Canada sales and services

3109 Lomita Boulevard, Torrance, CA 90505-5108, USA

Tel :1-310-325-8860 Fax : 1-310-325-8867

URL: [http : // www.kyotokagaku.com](http://www.kyotokagaku.com)

E-mail : rw-kyoto@kyotokagaku.co.jp

Kyotokagaku MEM Training Centre:

Kyotokagaku Tokyo Branch

5-20-4 Koishikawa Bunkyo-ku Tokyo, 112-0002, JAPAN