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Computed Tomography

ISO 9001 ISO 13485 ISO 14001 ISO 45001 ISO 27001

Computed Tomography

Quality Control kits

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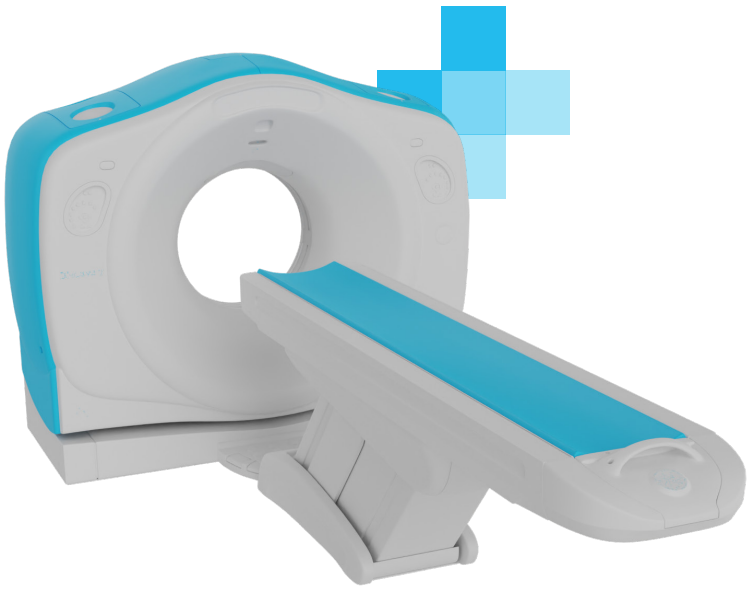

We have prepared several QA / QC kits consisting of must-have phantoms, accessories and software that you can use in different situations depending on your requirements.
These can be your go-to selections when you are not sure what to choose for tests of a given modality.
We have introduced gradation of kits depending on the purpose and level of sophistication required:

BASIC: these sets are meant for constancy level testing purposes - tests that can be done practically by everyone who can use a diagnostic device
PRO: sets meant for acceptance and specialized testing - performed by specialized personnel, for example a medical physicist

All pictures shown are for illustration purpose only. Actual product may vary due to product enhancement.

Pro-CT BASIC kit

04-001

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This kit is a versatile set of phantoms and software for carrying out constancy tests of computed tomography units. Thanks to the Diagnomatic subscription, all tests can be quickly and effortlessly automatically analysed online.

Standard kit configuration:

- Pro-CT mk II (04-410)
- Diagnomatic BASIC annual subscription
- carrying case with foam inlay

The kit can be used to measure:

- artefacts, noise
- homogeneity
- spatial resolution (high contrast resolution)
- PSF, MTF
- sensitivity (low contrast resolution)
- size dependence
- contrast scale
- slice thickness
- alignment
- linearity
- beamwidth

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
  - AAPM guideline
  - 21CFR 1020.33 specifications
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

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Pro-CT PRO kit

04-002

Powered by:

DIAGNOMATIC ONLINE

This kit is a versatile set of phantoms and software for carrying out constancy tests of computed tomography units. Thanks to the Diagnomatic subscription, all tests can be quickly and effortlessly automatically analysed online.

Standard kit configuration:

- Pro-CT mk II (04-410, with 04-411, 04-413, 04-414,)
- Diagnomatic BASIC annual subscription
- carrying case with foam inlay

The kit can be used to measure:

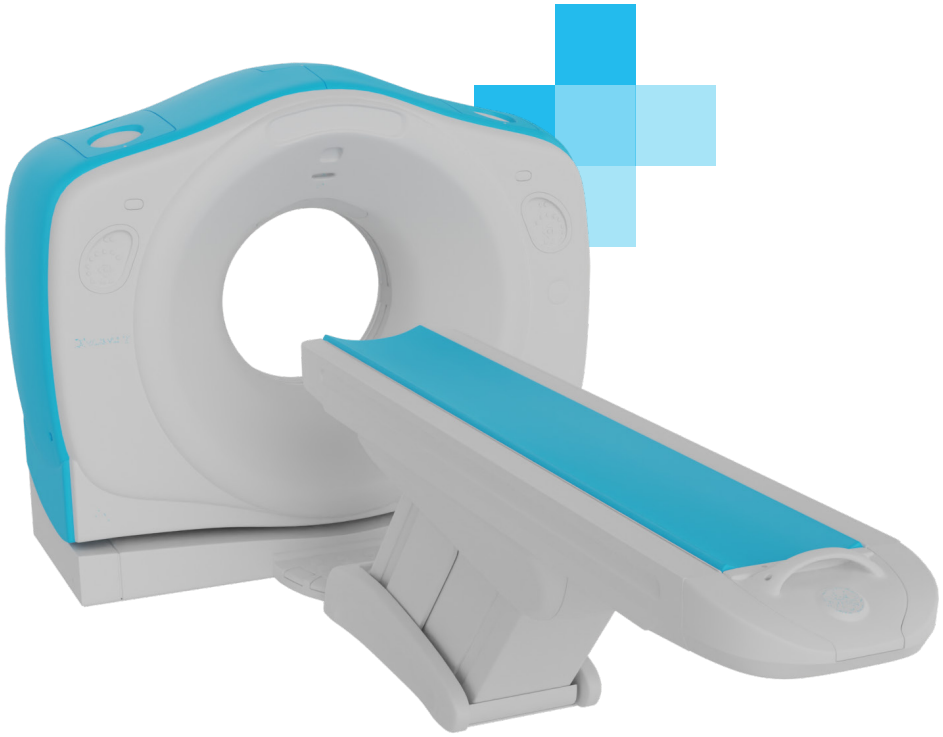
- artefacts, noise
- homogeneity
- spatial resolution (high contrast resolution)
- PSF, MTF
- sensitivity (low contrast resolution)
- size dependence
- contrast scale
- slice thickness
- alignment
- linearity
- beamwidth
- alignment of the internal and external lasers

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
  - AAPM guideline
  - 21CFR 1020.33 specifications
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

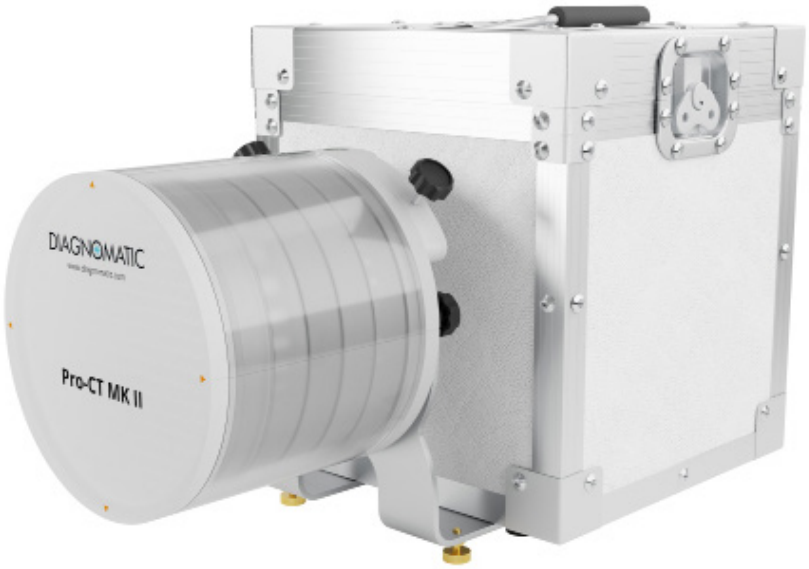
Computed Tomography

Phantoms



Pro-CT MK II

04-410

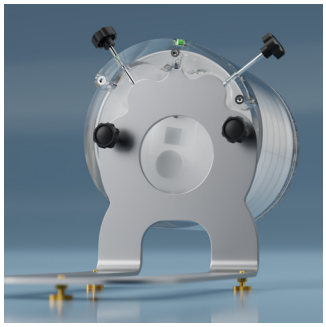
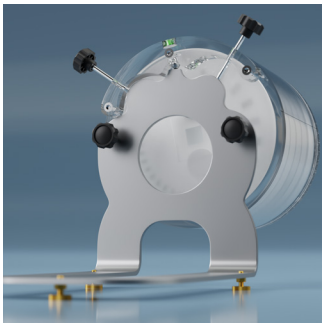
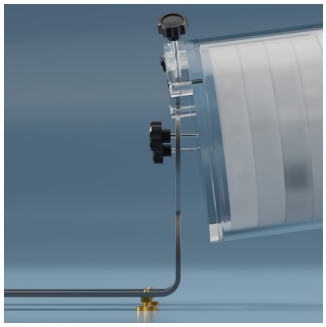
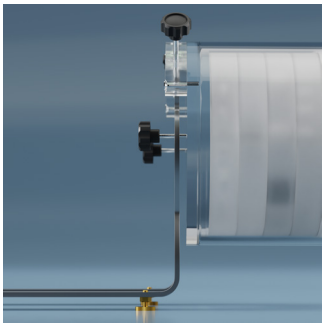


The Pro-CT mk II phantom can be used for carrying out acceptance and constancy tests of computed tomography systems according to IEC 61223-3-5 and the AAPM (American Association of Physicists in Medicine) guidelines. This phantom consists of several test modules placed inside a cylindrical container that can be mounted either directly on a holder of the CT table or on an adjustable stand. It allows accurate alignment for measurements on and off the table. Markings on the phantom and leveling aids provide further facilitation of the positioning process.

The Phantom can be used to do the following tests:

- geometric distortion
- CT number (HU) measurement
- noise / uniformity
- artefacts
- MTF
- SSP, LSF, PSF
- CNR
- spatial resolution
- spatial resolution in Z dimension
- contrast resolution
- low contrast resolution
- slice profile
- alignment
- linearity
- beamwidth

Adjustable in two dimensions.

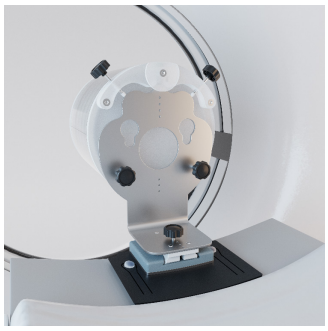





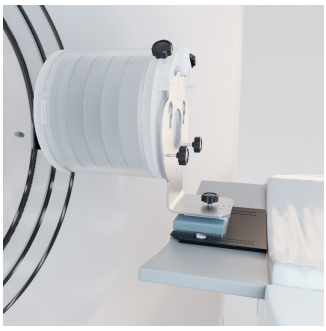
Technical data (can be modified to customer specifications):

- the main module contains a PMMA section with an array of holes 2 mm in diameter, 10 mm deep, and placed at 10 mm intervals
- outside diameter: 220 mm
- length: 250 mm
- optional external beam hardening rings:
  - 380 mm outside diameter (04-417)
  - 350 mm outside diameter (04-418)
  - 300 – 380 mm outside oval diameter (04-419)
  - 450 – 550 mm outside oval diameter (04-420)
- universal positioning stand for on and off-table measurements (04-550)
- optional dedicated adapters for various manufacturers:
  - (04-551) Canon Medical Systems
  - (04-552) Siemens Healthineers
  - (04-553) GE Healthcare
- carrying case

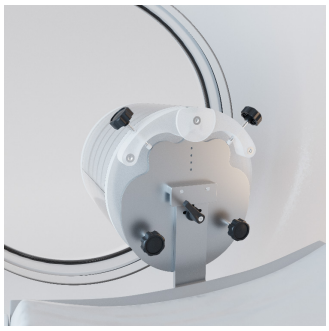
Optional dedicated adapters for various manufacturers

(04-551) Canon Medical Systems

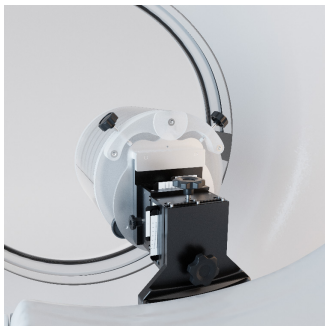




(04-552) Siemens Healthineers



(04-553) GE Healthcare



Modules

Low contrast

- diameter: 200 mm
- thickness 30 mm
- made of PMMA
- contains three groups of low-contrast objects: in each group, there are rods of the same density, 20 mm in height and with a diameter ranging from 1 to 15 mm. Contrast difference between groups and surrounding material is 0.3, 0.6 and 1%
- optional subslice targets having a nominal 1.0% contrast and z-axis lengths of 3, 5, and 7 mm. For each of these lengths, there are objects of 2, 3, 5, 7 and 9 mm in diameter (04-411)

Sensitometry

- diameter: 200 mm
- thickness: 30 mm
- contains 9 sensitometric samples shaped like rods (ø25 mm): PTFE, LDPE, POM-C, ABS, PA-6, PET, air, plastic water equivalent and PMMA – modules body

Geometry

- diameter: 200 mm
- thickness: 30 mm
- contains two pairs of steel wire ramps whose slope angle tangent is equal to 0.5
- middles of ramps intersect on the same plane allowing very precise evaluation of the slice location
- contains four ø5 mm rods and four ø3 mm rods from the air in the vertices of the regular octagon close to the outer perimeter of the phantom for evaluating symmetry and circular geometry
- optional nine spheres to evaluate the scanner's imaging of subslice spherical volumes, diameters: 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0 and 9.0 mm (04-413)

Spatial / high contrast module

- diameter: 200 mm
- thickness: 30 mm
- contains 13 concentrically placed high contrast elements for spatial resolution evaluation from 1 to 13 LP/cm
- two tungsten carbide beads Ø 0.18 mm and Ø 0.28 mm for MTF and SSP calculation
- Linear Spread Function (LSF) PTFE / PMMA interface
- Point Spread Function (PSF) - 0.25 mm stainless steel wire in air
- optional, additional concentrically placed high contrast elements for spatial resolution evaluation from 14 to 30 LP/cm (04-414)

Homogeneous

- diameter: 200 mm
- thickness 35 mm
- can be filled with water

Optional modules

Optional module made of Pro-Water water-equivalent (04-421)

- diameter: 200 mm
- thickness 30 mm
- mimics true water within 1% accuracy

Optional electron density module (04-416)

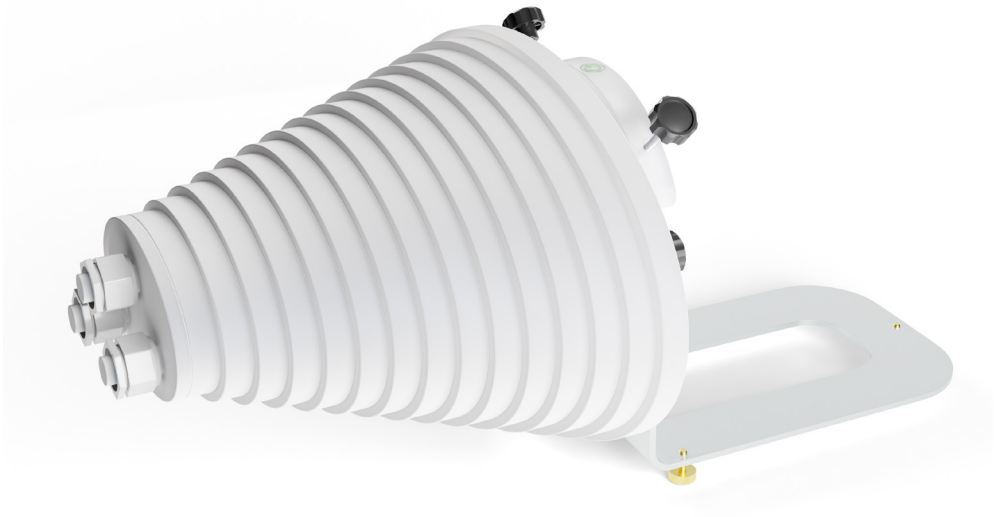
- diameter: 200 mm
- thickness: 30 mm
- contains samples of 10 different rod-shaped materials (Ø 30 mm x 27.5 mm) with known physical and electronic density corresponding to the following tissues: Lungs (inhalation), Lungs (exhalation), Breasts (50/50), Solid Trabecular Bone 200, Solid Dense Bone 800, Solid Dense Bone 1250, Liver, Muscles, Adipose tissue; additionally, a sample with water and, optionally, a titanium or steel rod

Product features:

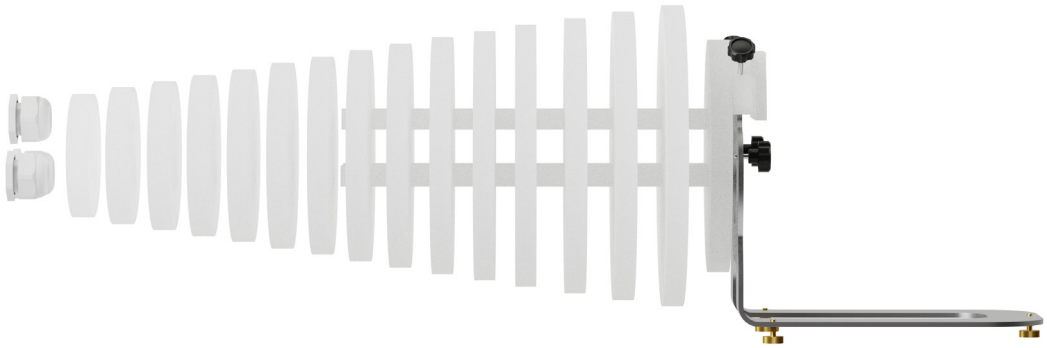
- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
  - AAPM guidelines
  - ACR guidelines
  - 21CFR 1020.33 specifications
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

Pro-CT AEC

04-301



The phantom used for AEC testing on CTs. All mounting and positioning features are the same as in the Pro-CT mk II phantom for off-the-table measurement.



Technical data (can be modified to customer specifications):

- 15 PMMA ellipses 20 mm thick and with different height and width
- elliptical cross section with major and minor axes ratio equal to 3:2
- ellipse sizes range from 175.5 mm x 117 mm to 428.7 mm x 285.8 mm
- positioning stand for on and off table measurements
- carrying case

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

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Pro-CT Align

04-601 - CT laser alignment check version
04-602 - CT laser alignment check and calibration version (with aluminium seeds insert)
04-603 - PET/CT alignment check version (with tungsten ball)

This phantom can be used to **check the alignment of the internal and external lasers to the radiographic center of CT and PET/CT units and to verify lateral gantry angle**. It can also be used with **accelerator units to check vertical and lateral gantry angles, laser alignment and vertical table movement**.

Technical data (can be modified to customer specifications):

- made of transparent PMMA 150 x 150 x 50 mm
- large 150 x 150 mm sides include:
  - centering scribe lines that go across the phantom on one side
  - two large holes 9.5 mm in diameter, 106 mm apart center to center in the exact center of a quadrant of the phantom
- small 50 x 150 mm sides include:
  - scribed lines through the center of all four sides
  - 2 of those sides are also scribed 50 mm from center
  - 3 pinholes one at center and two 50 mm from center
  - center pinholes are 2 mm in diameter and hold a tungsten pin 15 mm long
  - off center pinholes are 1.0 mm in diameter
- scribed lines are 1 mm wide and white for ease of viewing
- optional 5.5 mm diameter tungsten ball in the center for sterotactic collimator verification (it is removable for CT applications)
- optional insert containing 5 aluminium seeds 1 mm in diameter and 5 mm long with a chart indicating center to center spacing between seeds
- levelling platform:
  - made of transparent PMMA
  - dimensions: 150 x 150 x 10 mm
  - bubble level and three levelling screws

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
- CE certified
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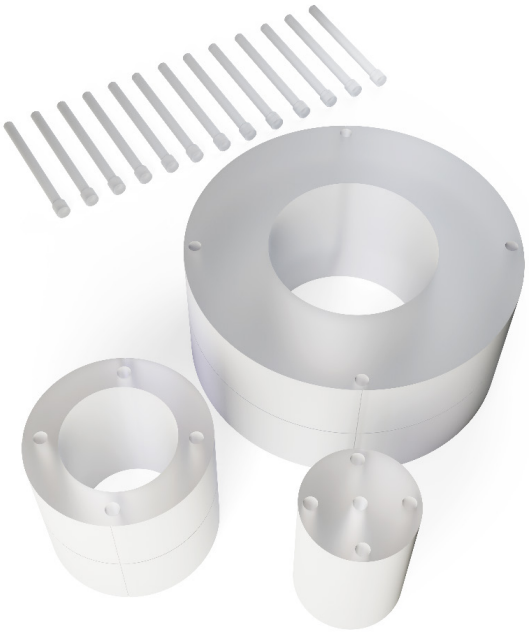
Pro-CT Dose

04-203 - Pro-CT Dose Head and Body nested set - L and M phantoms with 9 plugs and a case with a trolley (matte finish)
04-204 - Pro-CT Dose Adult and Paediatric nested set – L, M and S phantoms with 13 plugs and a case with a trolley (matte finish)



Set of homogenous cylinders designed to image paediatric and adult head and body.
Used for **CTDI measurement** and to separate dose information for each. When performing dose profile measurements, dose phantoms allow collecting information for the maximum, minimum and mid-range value of the nominal tomographic section thickness.

Technical data (can be modified to customer specifications):

- Pro-CT Dose L (adult body) – 150 mm thick homogenous PMMA cylinder, diameter: 320 mm, with five Ø13.1 mm CT probe holes (one in the middle and 4 around the perimeter, 90° apart and 10 mm from the edge)
- Pro-CT Dose M (adult head / paediatric body) – 150 mm thick homogenous cylinder, diameter: 160 mm, with five Ø13.1 mm CT probe holes (one in the middle and 4 around the perimeter, 90° apart and 10 mm from the edge)
- Pro-CT Dose S (paediatric head) – 150 mm thick homogenous cylinder, diameter: 100 mm, with five Ø13.1 mm CT probe holes (one in the middle and 4 around the perimeter, 90° apart and 10 mm from the edge)
- engraved crosshair markings on phantoms for easier positioning
- acrylic rods for plugging all holes in the phantoms
- nested versions of the above phantoms are also available, where smaller cylinders can be inserted into larger ones together creating one solid cylinder
- carrying case, also with a trolley option

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
  - 21CFR 1020.33 specifications
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

Pro-CT Dose AAPM TG-111

04-210

This phantom is **designed according to AAPM TG-111 findings**. The phantom comprises three 20 cm thick PMMA cylinders 300 mm in diameter similar to the standard Pro-CT Dose phantom. The total length of the phantom is 600 mm. **This allows capturing the majority of the scattered radiation and gives more accurate results than standard PMMA cylinders – 150 mm long**, 320 mm in diameter. Due to the large mass of the phantom, it is manufactured in three separate sections. In order to keep these sections aligned, mounting screws are included in the design.

Technical data (can be modified to customer specifications):

- total dimensions: diameter 300 mm, length 600 mm
- made of PMMA
- built of 3 separate 200 mm thick homogenous PMMA cylinders, with five Ø13.1 mm CT probe holes (one in the middle and 4 around the perimeter, 90° apart and 10 mm from the edge)
- 4x 620 mm long PMMA filler plugs with thread to fill unused holes and hold all cylinders together
- 2x additional PMMA rods to help center the probe tip in the middle of the phantom
- engraved markings on phantoms for easier positioning
- carrying case with a trolley

Product features:

- complies with:
  - AAPM TG-111
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

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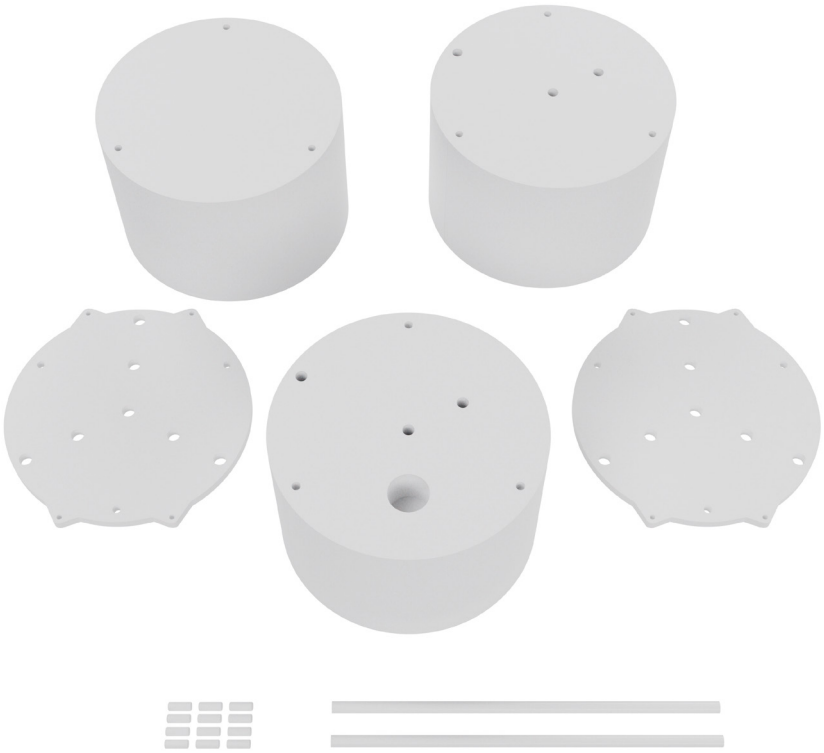
Pro-CT Dose AAPM TG-200 / Pro-CT Dose ICRU 87

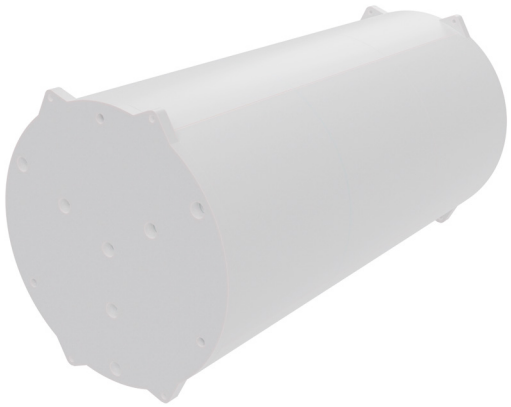
04-220



This phantom is **designed according to ICRU 87 report and AAPM TG-200 specifications**.
The phantom comprises high-density polyethylene (mass density of 0.97 g/cm3) and is 300 mm in diameter. The total length of the phantom is 600 mm. **This allows capturing the majority of the scattered radiation and gives more accurate results than standard PMMA** cylinders – 150 mm long, 320 mm in diameter.
Due to the large mass of the phantom, it is manufactured in three separate sections. In order to keep these sections aligned, alignment pegs are included in the design.

Technical data (can be modified to customer specifications):

- total dimensions: diameter 300 mm, length 600 mm
- made of high-density polyethylene
- built of 3 separate 200 mm sections:
  - cable section (A) contains three holes Ø13.1mm where detector cable rests during measurements
  - functional section (B) contains three holes Ø13.1mm for positioning CT detector and Ø44.45 mm, 50.8 mm deep hole for MTF (modular transfer function) calculation
  - blank section (C) is free of any structures that can be used for noise pow er spectrum (NPS) evaluation
- 2x 12 mm thick polyethylene end cups to keep all modules together
- 2x 420 mm long polyethylene filler plugs to fill unused holes
- additional polyethylene rod to help center the probe tip in the middle section
- 12x locating plugs to help in correct phantom assembly
- engraved markings on phantoms for easier positioning
- carrying case with a trolley

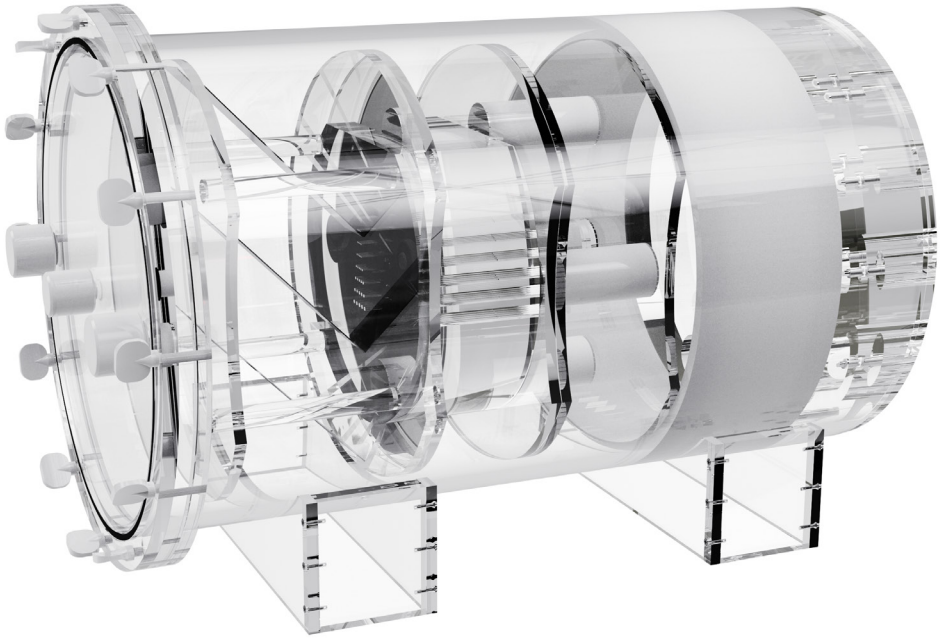


Product features:

- complies with:
  - ICRU report 87
  - AAPM TG-200
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

Pro-CT AAPM

04-501



The Pro-CT AAPM phantom can be used for **carrying out tests of computed tomography systems** according to **Report no. 1 of the AAPM** (American Association of Physicists in Medicine).

Technical data (can be modified to customer specifications):

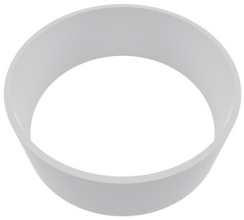
PMMA water tank

- inside cylinder diameter: 214 mm
- outside cylinder diameter: 220 mm
- lid has quick disconnect valves for ease of filling and draining
- aluminum alignment pin (Ø 6.3 mm x 76 mm) or a polystyrene TLD insert (for dose measurements) can be attached to the lid

Low contrast section

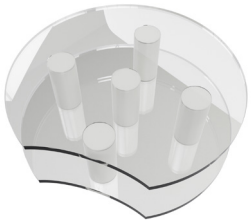
- placed at one end of the water tank
- 12 fillable cavities 40 mm deep
- two pieces of each cavity with diameters: 25.4, 19.0, 12.7, 9.5, 6.4 and 3.2 mm
- spaced twice their diameter apart from the centerline
- cavities can be easily filled from the outside with dextrose or sodium chloride solutions of various concentrations

Bone insert



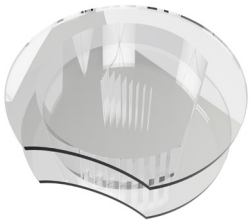
- PTFE annulus
- wall thickness 6.4 mm, 70 mm long
- fits over all inserts to harden the beam

CT number linearity insert



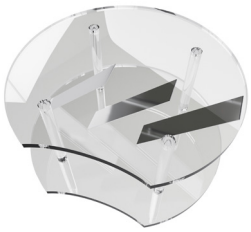
- five 25 mm rods
- material: polyethylene, PMMA (acrylic), polycarbonate, polystyrene and nylon
- density values (g/cm3): 0.95, 1.19, 1.20, 1.05 and 1.1 respectively

Resolution insert



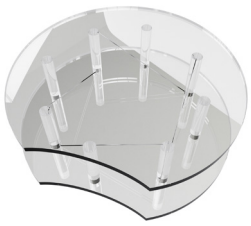
- eight sets / rows of air thru holes (five holes per set)
- diameters of holes: 1.75, 1.5, 1.25, 1.00, 0.75, 0.61, 0.50 and 0.40 mm
- distance between each hole is equal to the hole diameter
- distance between rows 5mm
- 0.2 mm stainless steel wire positioned longitudinally for calculation of line-spread function

Slice thickness insert



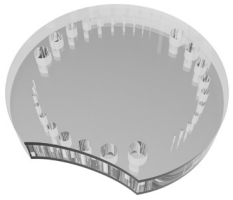
- three aluminum strips, 0.5 mm thick and 25 mm wide angled at 45°, positioned at the centre and aligned vertically

Geometry insert (optional)



- contains two pairs of aluminium wire ramps whose slope angle tangent is equal to 0.5
- middles of ramps intersect on the same plane allowing for very precise evaluation of the slice location
- contains two sets of four PMMA rods (Ø 10mm) placed in vertexes of two squares (sides 100 mm long)

Triple low contrast insert (optional)



- contains three groups of low-contrast objects. In each group, there are rods of the same density, 20 mm in height and with a diameter ranging from 2 to 15 mm. Density difference between groups and surrounding material is exactly 0.3%, 0.6% and 1.0%
- made of PMMA

Filling tubes

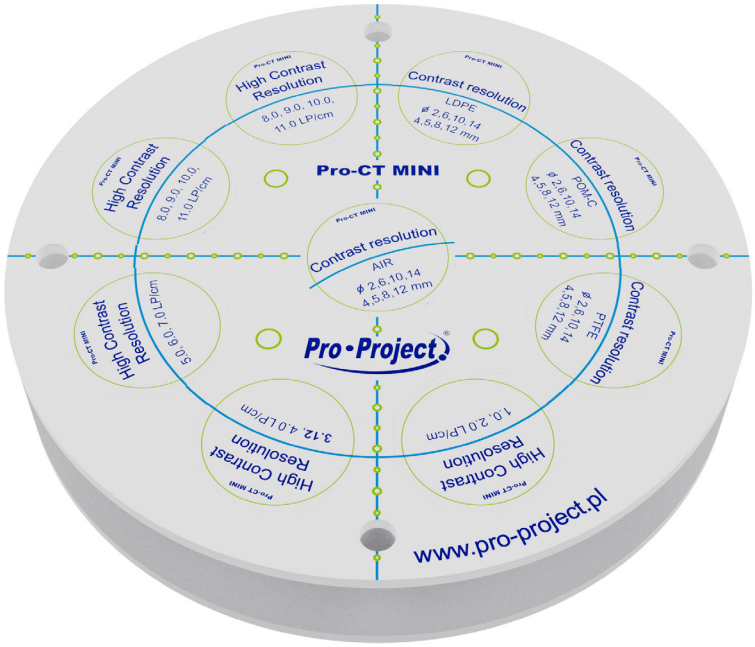
Optional heavy duty carrying case (04-502)

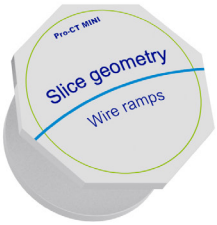
Product features:

- complies with:
  - ICRU report 87
  - AAPM TG-200
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

Pro-CT MINI

04-403

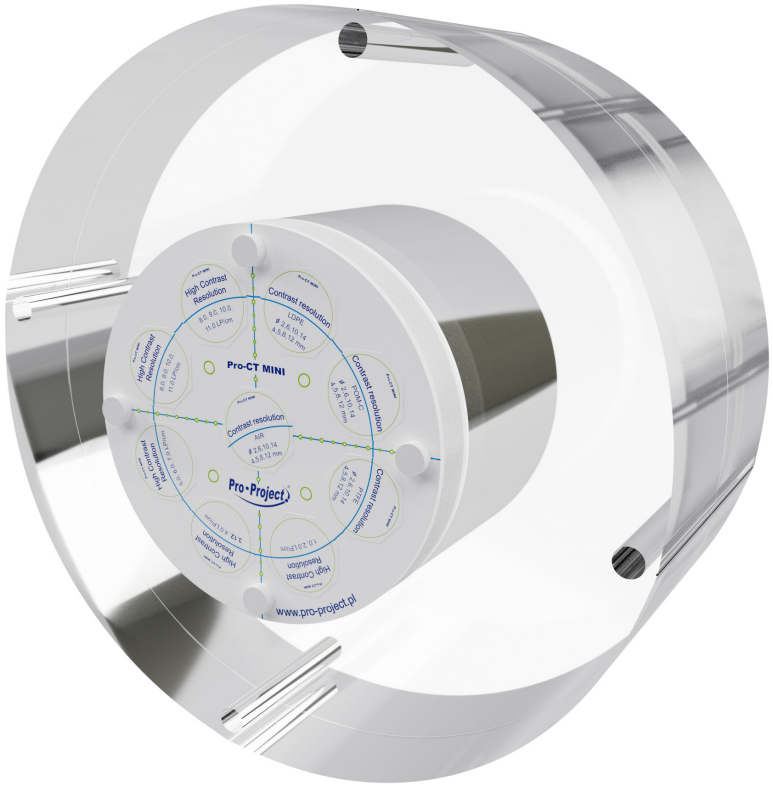




The Pro-CT MINI phantom is a compact CT image quality testing solution. When connected with Pro-CT Dose it may be used for carrying out **acceptance and constancy tests of computed tomography** systems according to **IEC 61223-3-5** and the **AAPM** (American Association of Physicists in Medicine) guidelines. This phantom consists of a module 16cm in diameter with positioning aids and recesses for test modules.

Pro-CT Dose the phantom can be used to do the following tests:

- geometric distortion
- CT number (HU) measurement
- noise / uniformity
- artefacts
- MTF
- spatial resolution
- contrast resolution
- low contrast resolution
- slice profile
- alignment
- linearity
- beamwidth



Technical data (can be modified to customer specifications):

- main module:
  - diameter 160 mm
  - thickness 30 mm
  - 9 recesses for test inserts allow customized placement of test objects in space
  - markings for easy and accurate positioning in the CT scanner
  - set of holes on a given depth for testing geometry, distortions and slice position
  - screws and extra plugs for mounting the module on any Pro-CT Dose Phantom (04-319)
- standard test inserts:
  - 5 contrast resolution inserts containing rods made from different materials: LDPE, PTFE, POM-C, air, plastic water equivalent. Diameters of rods in each insert are: 2, 4, 6, 8, 10, 12, 14 mm
  - high contrast resolution inserts containing 11 aluminium test elements for spatial resolution evaluation from 1 to 11 LP/cm
  - 2 geometry modules containing two pairs of aluminium wire ramps whose slope angle tangent is equal to 0.5
  - Linear Spread Function (LSF) insert - PTFE / PMMA interface
  - Point Spread Function (PSF) insert - 0.25 mm tungsten steel wire in air
- optional inserts (04-404):
  - 3 low contrast inserts containing rods with a diameter: 2, 4, 5, 6, 8, 10, 12, 14 mm. The contrast difference between the rods and the surrounding material are 0.3, 0.6 and 1%
  - 3 high contrast resolution inserts containing 19 aluminium test elements for spatial resolution evaluation from 12 to 30 LP/cm
- carrying case

Product features:

- complies with:
  - IEC 61223-3-5
  - IEC 61223-2-6
  - AAPM guidelines
- CE certified
- the Manual provides detailed guidelines for carrying out each test, results assessment and registration

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